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THESIS

Cost Accounting in the Market Milk Industry

by

Donald Young McMillan
(B. S. A. University of Toronto 1940)

submitted in partial fulfillment of
the requirements for the degree of

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INTRODUCTION

United States production of raw milk since 1941 has reached new high levels in 1943 totaling 56,263,000,000 quarts of which 25,083,000,000 quarts were consumed as fluid milk and cream. The cow population has jumped from 24,926,000 in 1940 to 27,607,000 in 1944. (1) In 1943 six large dairy companies produced sales totaling $1,348,301,800 with a net profit of 2.80% or $37,740,800. (2) From these few illustrations it can readily be seen that the Market Milk Industry is much larger than most people realize.

The success or failure of any business may often be determined by its accounting methods and the accuracy and completeness of its records. Adequate records are necessary in the Market Milk Industry since policies determined by management must depend upon the service given by different types of equipment; number of employees required to produce a given volume of bottled milk; the extent of territory from which raw milk will be gathered; the quality of product and many other phases of operation.

In this Industry the distributer has been caught between two millstones, since the selling price and the cost of raw milk has been set by Milk Control Boards. This has

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(1) Milk Industry Foundation, "Milk Industry for Victory", November, 1944.

(2) Gerwig & Gerwig, Statisticians, Chicago, Ill. (no title) courtesy Silverwood Dairies, London, Canada.

made the Industry turn to the production phase of the business in which the elements are less subject to regulations. It is not sufficient, however, merely to desire low production costs. They must be achieved by constant attention and analysis. Cost accounting supplies this need by which expenditures are constantly recorded and watched, regularly compared with standards and actual results, and effectively controlled.

When you review the cost work already published in the Dairy Industry most of this work has been done on the cost of production of milk to the farmer. Many of the various Agricultural Experimental Stations have published their findings and a few have branched out into suggestions on ways of organizing and financing farmer co-operatives. However, this has been the exception rather than the rule.

Most of the research work published by Agricultural Experimental Stations on this particular subject has been done on the cost of distribution of the product from the time it left the plant until it reached the consumer. Perhaps the cause for this particular field being considered was the fact that distribution costs seemed too high in comparison with costs of the other operations which make up the selling price of a quart of milk.

This thesis will be devoted to the study of costs which make up the cost of a quart of milk from the time the milk is received by the milk plant until it is ready to be shipped. Its purpose is to present methods of installing and

maintaining business records that will be applicable to this particular industry, to illustrate various forms which may be used, and to discuss several accounts used in a standard accounting cost system.

I. COST SYSTEMS

A. Types of Cost Systems

Cost accounting in the formal sense is relatively new. The accountant attempts to determine costs and assign these to the accounting period. It appears, for example, that cost accounting data will be used more and more as complete and final answers to questions which actually should be settled on the basis of much broader information.

Dixon (1) suggested that by assigning all of the costs of the business to its products an end result can be obtained which could be used with confidence in the establishment of product prices. How far cost accounting allocations should be carried is quite a problem but it is suggested that as a general rule it is better to do too little than to do too much.

Bishop (2) stated that we must consider the important principal aspects of a cost system. We may term "cost finding" as the tracking down of expenditures to significant units of production which after establishing proper principles is largely routine in nature. Cost accounts results should be summarized in a convenient and concise form. These accounts should be set up to provide maximum control possible over materials, labor, and manufacturing overhead.

(1) Dixon, Robert L., "Cost Accounting Principles", Journal of Accountancy, Vol. 77, No. 3, March, 1944

(2) Bishop, A. E., "General Principles of Cost Accounting", The Accountants Digest, Vol. 10, No. 1, September, 1944

It must be remembered that cost accounting is not an exact science. Costs obtained by using any of the following systems will contain some elements of estimation. However, the system which is installed must fit the business and not the business fit the system.

1. Process Cost System

This system of accounts was primarily designed for industrial concerns which manufactured on a mass production basis. Productive processes are standardized and commodities are produced for warehouse stock. In this system the cost of a given lot is obtained and the unit costs of the products are then computed on an arithmetic average basis.

2. Job Cost System

This type is especially suited for companies which manufacture special jobs in accordance with customers' orders. In job cost system, the cost of each individual job is assembled on separate job cost records.

3. Accounting for Joint Products

Joint products and joint costs are found in industries where the conversion of the direct material into finished goods results in the production of more than one product. This system is usually an adaptation of a process cost system which are added the necessary refinements to provide for the proper assembling of the desired costs.

4. Accounting For By-Products

Where the conversion of the raw material into the finished product results in the production of a major article and one or more minor articles a system may be installed which is a combination of a process cost system and joint cost system.

5. Actual Cost System

This type of cost system provides for the accumulation of the costs of production in such a manner that the unit costs of the various products and the job costs of the special orders reflect the total actual costs applicable to the products and jobs completed.

6. Estimated Cost System

Estimated Cost System can be used in concerns where a cost estimate of a contract is required by the purchaser before the contract is given. The actual cost of production is compared with the estimated cost of production in order to ascertain the cost variances.

7. Standard Cost System

The Standard Cost System is the most recently developed type. The production costs are predetermined on the basis of past operations and present trends in the industry and are set for the cost elements before production is commenced. Actual costs are collected and are then compared with the standard costs in order to determine the cost variances.

8. Marketing Cost System

A Marketing Cost System sould make use of some of the the fundamental principles found in a process system in developing a procedure to measure the effectiveness of and to extablish control over the marketing of products.

9. Budgetary Control System

A complete budgetary control extends into all divisions and departments of a business. Annual and monthly estimations are made for all incomes, costs, and expenses. Annual and monthly net profits may also be forecasted.

10. Miscellaneous Cost Classifications

a. Uniform Cost - This type of system has been designed by trade associations or regulated by governmental action. It is used to compare efficiency of production within the industry.

b. Historical Cost - This is ascertained after production has been completed.

c. Conversion Cost --The cost of transforming direct materials into the finished products, exclusive of the direct material cost, is known as conversion.

d. Cost Plus - A job or contract to whose cost is added an arbitary percentage of the cost to establish the selling price is called a cost plus contract.

B. Definitions of Standard Costs

Blocker (1) has defined Standard Costs as:

> "Standard costs represent the best estimate that can be made of what costs should be for material, waste, and overhead after eliminating inefficiencies and waste. Standard Costs are subject to revision only when there has been a change in the price level of materials and labor, or when there has been an alteration in factory methods or in the use of machinery. Standard costs represent management's best measure of efficient plan operation."

Dawson (2) summarized standard costs as:

> "The total cost of material entering directly into the product manufactured, the total of the labor cost in fabricating such material, and the various incidental expenses involved which cannot be place directly on to the product as either direct material or direct labor but concerning which expenses the product should stand its share."

Camman (3) suggested that standard costs were closely linked with budgetary control. Reittell (4) said that standard costs "Are the amount that the given operation or job to which they apply should cost under normal operation conditions."

(1) Blocker, J.G., "Essentials of Cost Accounting", McGraw-Hill Book Co., 1942, pp. 19

(2) Dawson, R., "What are Standard Costs?", The Accountants Digest, Vol. 7, No. 4, June, 1942

(3) Camman, E.A., "Basic Standard Costs", American Institute Publishing Co., New York, 1932, pp.34-37

(4) Reitell, C., "Cost Accounting Principles and Methods", International Textbook Company, Scranton, Pa., 1934, pp. 17

Fox (1) suggested that; "Cost accounting can be an invaluable aid to management". Sherritt (2) made the suggestion that cost system must be sufficiently elastic as to permit cost departments to satisfactorily cope with variations in factory production technique without expensive delays in the supplying of cost data.

Perren (3) writing of cost accounting in Europe believed that costing principles were more concerned with "real costs" rather than "money costs".

C. Advantages of Using Standard Costs in the Market Milk Industry

Standard cost accounting can furnish the unit cost of each article, or of each class of similar articles or products in the Market Milk Industry. This makes possible a direct comparison of cost to manufacture milk products, thereby bringing management immediately into contact with a way of measuring the accomplishment of the primary object of the business, namely, the earning of profit.

The comparison of unit costs enables the management to determine the relative profitableness of different types of dairy products. This knowledge may aid in the establishment, within the limits set by the competitive conditions of

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(1) Fox, H.F., "Some Concepts of Cost Accounting", The Accountants Digest, Vol. 9, No. 3, March, 1944

(2) Sherritt, L.W., "Preliminary Consideration to the Installation of the Cost System", The Accountants Digest, Vol. 9, No. 4, June, 1944

(3) Perren, A., "The Development of Cost Accounting in Europe", N.A.C.A., Bulletin Vol. 25, No. 19, June 1, 1944.

the market, correct selling prices. It may also make possible the elimination of unprofitable lines.

The type of accounting will furnish management with convincing evidence of the relationship between cost and volume of business. This is important if quotations are to be estimated on large contracts.

A uniform standard cost system would tend to make the manufacturer who works by rule-of-thumb see the advantages of adopting the methods which his competitors are successfully using. If a standard system is used in the industry, the making of comparison of actual costs of competitors is made very much easier.

II. REVIEW OF COST LITERATURE IN THE MARKET MILK INDUSTRY

A. Cost of Raw Material-Fluid Milk

Mathematically, there are three factors which should determine what the price of milk should be. They are (1) the price of Class 1 milk (fluid milk), (2) the price of manufacturing milk (milk sent to condenseries etc.) (3) the proportions of total receipts which are disposed of for Class 1 and for manufacturing uses.

One method of determining what prices for milk would be proper under wartime conditions is to adjust the milk price in a pre-war period by the same percentage that various other prices, wage rates, etc, have changed. The average farm price of milk during the years 1910-14, was $1.60 per hundred-weight. If this price were raised as much as the index of dairy farm costs have increased since 1910-14, the 1943 price would be $3.12 per hundredweight. (1) In 1943 the fluid milk price in the State of New York was $3.18 per hundredweight while the average for the United States was $3.12.

A study of the extra costs of producing milk over evaporated milk was made by the National Dairy Products Corporation. They found that the extra cost of 33.37¢ per hundred-weight was mainly due to (a) requirements of the local Board of Health, (b) transporting milk to the fluid

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(1) Spencer, Leland, "Pricing Milk in Wartime", address 9th Annual Meeting, International Association of Milk Control Agencies, Philadelphia, Pa., September, 1943

market, and (c) extra cost in the fluid milk industry to attract adequate supply of milk. (1)

Brown and Donley (2) found that the average price of milk delivered to plants in the Springfield market area in 1935 was $2.82 per hundredweight or slightly more than 6¢ per quart of 3.7 percent milk.

Nadeau (3) made a comparison of producer's price per hundredweight with consumer's price per quart. It was noted that a price of 11¢ per quart allowed the producer a price of $2.05 while 15¢ per quart raised the price per hundredweight to $3.15.

At present in the Boston Milk Market as well as certain other large milk areas the price to the distributor has been set by the Federal Milk Marketing Board. At the present time each distributor must pay the same price for his raw product as his competitor. Before the price paid for milk to the producer can be raised it must be sanctioned by the above mentioned Federal agency and the Milk Industry as a whole must pay the increased price.

(1) Young, Paul, "What are the Extra Costs of Requirements for the Production of Fluid Market Milk Over Milk for Manufacturing Purposes?", I.A.M.D. Association Bulletin, Vol. 33, No. 11, January 20, 1941

(2) Brown, Alfred A., and Donley, J. Elizabeth, "Product Costs of Milk to Dealers in the Springfield Area, 1935, Mass. Agr. Exp. Sta., Bulletin No. 365, July, 1939

(3) Nadeau, J. Peter, Address, 8th Annual Meeting, International Association of Milk Control Agencies, Richmond, Virginia, October, 1942

1. Hauling Charges

Many steps have been taken during the past few years to conserve vital transporation facilities used in assembling and distributing milk. The possibilities for conserving transporation facilities include (a) rerouting, (b) consolidation of routes, and (c) limitation and modification of services rendered and reorganization of methods.

Abrahamsen (1) reported by consolidation of two routes, efficiency in assembling milk could be increased about 30 percent with much lower hauling charges.

Brown and Booth (2) made a study of cartage rates applicable through the Springfield Milkshed. They found that the rates ranged from 8 to 80 cents per hundredweight, 78.8 percent of the producers paid from 23.4 to 46.5¢ or 1/2 to 1¢ per quart, whereas 34.9 percent of the producers paid from 30.1 to 35.0¢ or approximately 3/4¢ per hundredweight was relatively low.

Brown and Donley (3) reported certain causes which would affect the hauling charges. Among them were (a)

(1) Abramhamsen, M.A., "Milk Assembling and Distribution in Harrison County, West Virginia", West Virginia Agr. Exp. Sta. Mimeographed Circular No. 47, May, 1943

(2) Brown, Alfred A., and Booth, Mabelle, "Production and Prices of Milk in the Springfield-Holyoke-Chicopee Milkshed in 1935", Mass. Agr. Exp. Sta., Bulletin No. 389, February, 1942.

(3) Brown, Alfred A., and Donley, J. Elizabeth, "Milk Cartage in the Southwick-Agawam Area of the Springfield Milkshed", Mass. Agr. Exp. Sta., Bulletin No. 363, May, 1939

distance from market, (b) size of shipment, (c) percentage of Class II in shipment, (d) quality of product, (e) location of farm, and (f) regularity of shipment.

Hardin (1) averaged the hauling charges in the milk markets of Indiana and found that the lowest average for transportation for the 3-year period, 1938 to 1940, amounted to 18¢ per hundredweight. The highest charge was 35¢ per hundredweight while the average was 23¢.

Roberts and Price (2) summarized the hauling charges to 224 producers in Kentucky and found that the rates varied from 11 to 37¢ and the hauling distance from 4 to 55 miles. Most of the differences in hauling charges were associated with the location of the farm, the type of highway, and the service rendered.

Since much of the Boston milk and cream supply must be moved through long distances, transportation charges account for a considerable portion of total marketing cost. During part of 1939 Sonley (3) found that milk shipped by rail in tankcars was the cheapest method of transportation and amounted

(1) Hardin, Clifford M., "An Economic Analysis of Fluid Milk Markets in Indiana", Purdue University, Bulletin 463, August, 1941

(2) Roberts, John B., and Price, H.B., "Organization and Management of the Falls Cities Cooperative Milk Producers' Association", Ky. Agr. Exp. Sta., Bulletin No. 390, January, 1939

(3) Sonley, L.T., "Cost of Transporting Milk and Cream to Boston", Vt. Agr. Exp. Sta., Bulletin No. 462, July, 1942

to over 10 percent of the price of Grade A milk and over 5 percent of the retail price for delivered Grade B milk. On the whole railway rates were under truck rates.

Ulrey (1) noted that in the Kalamazoo Milk Market the hauling charge from the farm to the city plant was about 12 percent of the total spread between the price at the farm and at retail.

Varney (2) found that in the State of New York truck transporation was less than rail rates plus transfer charges up to about 200 miles. The cost of operating tank trucks which hauled milk from the country averages 15.5¢ a mile.

B. Plant Costs

Efficient operation of manufacturing plants should require detailed attention to costs. This attention frequently discloses opportunities for decreasing some items of expense, permits the early detection and correction of inefficiencies, and enables the management to keep in constant touch with operations. The detail necessary to attain these desirable ends can be obtained only through adequate and well designed accounting systems.

1. Equipment Costs

The costs associated with the equipment used by

(1) Ulrey, Orion, "The Kalamazoo Milk Market", Mich. State College, Special Bulletin No. 300, December, 1939

(2) Varney, H. R., "Transportation of Milk and Cream to the New York Market", Cornell University, Bulletin No. 655, August, 1936

milk distributors should include depreciation, installation, and repair costs. Depreciation can be computed by dividing the difference between original value and scrap value by the estimated life-time of the equipment.

The large bottle washer known as soaker type was estimates in 1931 to have a life of ten years. However, in 1942 this was raised to sixteen years. Bottle fillers and cappers were estimated to last five years in 1931 and twelve years in 1942. Most other pieces of dairy equipment can be estimated to have a life of fifteen years. (1)

2. Plant Labor Costs

The labor needed to handle milk in plants should constitute the largest element in total plant costs. Dow(2) in determining ratios for plant labor estimated that the weighted ratios to be used for computing quarts of retail milk for all plant labor, should be 1.0¢ for quart bottles, 1.5¢ for pint bottles, and 2.5¢ for half-pint bottles.

Herrmann and Welden (3) found that in market milk cooperatives, labor accounted for more than 16 percent of sales income of close to 45 percent of all operating expenses.

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(1) Milk Dealer, "Depreciation Rates on Milk Processing Equipment", Vol. 31, No. 11, August, 1942

(2) Dow, George F., "An Economic Study of Milk Distribution In Main Markets", Maine Agr. Exp. Sta., Bulletin 395, March, 1939

(3) Herrmann, Louis,F., and Welden, Wm. C., "Distribution of Milk by Farmers' Cooperative Associations", Farm Credit Administration, U.S.D.A. Circular C-124, June, 1941

Hughes (1) found labor costs of almost 0.7¢ per quart of milk sold. Wages seemed to make up a larger percentage of the total plant expenditure in plants which did not pasteurize their product. This was probably due to the greater amount of hand work and less use of labor-saving devices such as mechanical bottlers and bottle fillers.

Malone (2) noted that 50 percent of all milk plant operating costs was made up by labor. Accurate figures on employees hours and jobs should be tabulated.

Piper (3) showed that from 30 to 50 percent of the labor in a food plant is chargeable to the cleaning and sterilization of equipment. The adoption of the latest cleaning methods, cleaners, and cleansing supplies used with properly trained help should greatly reduce this high percentage.

3. Cost of Supplies

Hammerberg, Fellows, and Farr (4) made a summary of cost supplies figured on a per cost quart basis. The

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(1) Hughes, Earl M., "The Business of Milk Retailing by Producer-Distributors in New York State", Cornell University, Bulletin 741, November, 1940

(2) Malone, J.F., "Opportunitues for Reducing Operating Cost", I.A.M.D., Association Bulletin Vol. 34, No. 15 February, 1942

(3) Piper, Perry E., "Effective Cleaning Cuts Costs and Improves Product Quality", Food Industries, Vol. 16, No. 11, November, 1944

(4) Hammerberg, D.O., Fellows, I.F., and Farr, R.H., "Efficiency of Milk Marketing in Connecticut", Storrs Agr. Exp. Sta., Bulletin 243, December, 1942

unit costs was found to be .47¢ per quart. However, if the milk received a special process, this constant was raised by .21¢, thus making per quart cost of supplies .68¢.

On the other hand Hughes (1) found that container costs which included the expense for bottles, bottle caps, and bottle crates amounted to about one-fourth cent per quart of milk sold.

Vehlow (2) made a comparison of the cost of various types of containers and found that fibre containers were cheaper than the glass bottles on which there was no deposit charged. In the former the cost was .010469¢ while the latter showed a cost of .012796¢.

C. Cost of Processing Milk

The study of financial and operating statements of milk distributors will help to establish a basis for determination of the cost to produce a quart of bottled milk. The determination of unit costs in any business which deals with many products to which the costs of handling, processing, and distribution are applicable in varying proportions is extremely difficult. The results will be affected by the nature and availability of the underlying data and also by the manner in which the costs are allocated to the various processes.

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(1) Hughes, Earl M., op. cit.
(2) Vehlow, E.L., "The Single-Service Container and Its Effect on Milk Distribution Costs", I.A.M.D. Association Bulletin, Vol. 33, No. 16, March 23, 1941

1. Cost of Processing Milk in Massachusetts

In 1936 a "Summary Report on Cost of Distributing Milk in the Boston Market", was prepared for the Massachusetts Milk Control Board by the accounting firm of C. F. Rittenhouse and Company. The purpose of this survey was to bring to light the essential facts which have a direct bearing upon unit costs of a quart of milk. (1)

The costs for typical individual companies were determined and from the information gathered a weighted cost for the market as a whole was computed on a reasonable basis.

(1) Rittenhouse, C.F. and Co., "Summary Report on Cost of Distributing Milk in the Boston Market", prepared for the Massachusetts Milk Control Board, 1936

TABLE 1

Expenses Included In Weighted Average Retail Selling And Delivery Unit Costs Milk In The Boston Milk Market

Expenses	Quart of Milk Cost	Percentages
Hauling to Receiving Station	.0005	1.18%
Receiving Station Expenses	.0008	1.88
Chest Labor	.0009	2.12
Office and General Expenses*	.0029	6.82
Delivery Equipment Expenses*	.0081	19.06
Case Expense	.0002	.47
Ice	.0003	.71
Loss on Bad Accounts	.0014	3.29
Advertising and Sales Promotion	.0011	2.59
Supervision and General Labor	.0013	3.06
Solicitors	.0002	.47
Route Labor*	.0212	49.88
Administration*	.0036	8.47
Totals	$.0425	100.00%

*Total of four items

Expense	Percentages
Route Labor	49.88%
Delivery Equipment Expense	19.06
Administration	8.47
Office and General Expenses	6.82
	84.23%

Rittenhouse, C.F., and Co., "Summary Report on Cost of Distributing Milk in the Boston Market"

All of the expenses pertaining to the maintenance of the loading stations, exclusive of delivery equipment were charged to this expense account in the foregoing table.

The wage expense of the men handling the product from its receipt into the chest or at the loading station platform to its final loading was charged to chest labor.

Office and general expense both at the branch loading stations and at the main offices were chiefly charged to statistical and accounting control of the product handled.

Delivery equipment expenses included all staff expenses such as care of horses and wagons, shoeing and harnessing for horses, truck and wagon repairs, depreciation on trucks, and maintenance and garage expenses.

The depreciation and repairs on cases were charged to the case expense account.

Ice expense was allocated to products and units delivered on the routes.

The loss on accounts receivable was allocated to products and units on the basis of container units weighted for the average selling prices in effect during 1935.

Advertising and sales promotion included all items of expense usually coming within the meaning of these terms.

All supervision expense and direct labor expenses were charged to this account.

Solicitors' expenses consisted the salaries paid to men to secure new business.

The route labor included the payment of wages, commisions, premiums, bonuses, driver supervision expenses, driver helpers, spare men, and special delivery men.

Administration consisted of general executive, accounting, purchasing expense etc., which could not be directly allocated to the product.

2. Cost of Processing Milk in New Jersey

Several operations are involved in supplying New Jersey consumers with milk. The principal operations in order of occurrence are country handling and transportation, processing which includes pasteurizing and bottling, and delivery. Country handling is not of great importance with respect to price regulation under the New Jersey Milk Control Law as most of the milk which is produced and also consumed within the state moves directly from the farms to the processing plants. (1)

(1) Spencer, Leland, "Costs of Distributing Milk in New Jersey", New Jersey Department of Agriculture, Trenton, May, 1943

TABLE 2

Processing Costs Per Quart Bottle of Grade B Milk For The Year Ended June 30, 1942

Classification of Expense	Cost per quart	Per cent of total
Salaries and wages	$.0050	53.3
Payroll tax, compensation insurance	.0002	2.4
Total labor cost	.0052	55.7
Power and refrigeration	.0009	9.1
Repairs and Maintenance	.0009	9.8
Plant supplies	.0007	7.1
Depreciation	.0008	8.4
Rent, taxes, insurance, fees	.0005	5.1
Miscellaneous	.0004	4.8
Total other than labor	.0042	44.3
Total Cost	$.0094	100.0

Spencer, Leland, "Costs of Distributing Milk In New Jersey", New Jersey Department of Agriculture, Trenton, May, 1943

Labor costs made up nearly 56 per cent of the total processing cost while no other classification of expense represented as much as 10 per cent of the total.

Closely related to the processing cost are the expenses for shrinkage, caps and hoods, bottles and containers. It was found that most plants did not maintain records of product shrinkage. From such information as could be found it was estimated that shrinkage for fluid milk would amount to one and one-fourth percent when the price used for computing shrinkage cost was 7.5¢ per quart.

Records pertaining to the cost of caps and hoods used on the milk bottles were incomplete. From such information that was available it was estimated that the cost of caps used in packaging shown in the summary would be .06¢.

Milk bottle losses vary widely depending upon the size of the bottle, the type of customer served, and the amount of deposit charged for the bottle.

3. Cost of Processing Milk in Other Sections

In Michigan (1) producers obtained 47 percent of the price which consumers paid for bottle milk in quarts for the year 1939. The margin of $2.45 a hundredweight for 3.5 percent milk between the farm price and the retail price

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(1) Ulrey, Orion, op. cit.

was equivalent to 6.36¢ a quart. Consequently, any reduction in distribution cost must come primarily after the milk reaches the city plants in the processing, wholesaling, and retailing.

Comfort (1) made a breakdown of the consumer dollar for milk purchased in Chicago which was as follows:

"Farmer-raw products	$.4396
Labor	.3669
Bad Debts	.0036
Bottle, Box, and Can Loss	.0163
Property Operating Expenses	.0646
Depreciation	.0239
Taxes, Licenses, and Unemployment Compensation	.0274
Insurance	.0054
Freight	.0165
Salaries of Officers or Owners	.0102
All Other Expenses	.0343
Profit or Loss	.0087
Total	$1.0000"

Dow (2) made a comparison of Income, Expenses, and Profit or Loss of Milk Distributors in various markets and found that cost of dairy products varied from 44 to 69 percent of total sales value leaving a net profit or loss from minus 8 to plus 14 percent.

Dow (3) found in Maine that the producers paid a uniform price for all fluid milk sold but charged consumers different prices depending on whether sales were in quart,

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(1) Comfort, Harold W., "Facts for Consumers Regarding Cost of Milk", I.A.M.D., Association Bulletin Vol. 33, December, 1940

(2) Dow, George F., op. cit.

(3) Dow, George F., "Receipts, Utilization, and Prices of Milk and Cream in Maine Milk Control Areas", Maine Agr. Exp. Sta., Bulletin 399, March, 1940

pint or one-half pint bottles.

D. Forecasting Monthly Receipts of Milk

Methods of prediction should be based on data concerning either how or why production varied with the reasons submitted. Johnson (1) found data available as basis for forecasting included receipts in previous periods, milk prices, grain prices, cow prices, percentages of all cows dry in crop-reporters' herds, cow and heifer numbers, and pasture conditions.

The simplest and most obvious method to use in predicting future receipts of milk is to take receipts for each month of the preceding year as the estimate for the corresponding month of the current year. It was found that in general, predictions of future receipts could be made more accurately for the winter than for the summer months.

E. Cost Systems Used by Plants.

In order that the nature of accounting may be clearly understood it should be emphasized that accounting is not a process of valuation. It is essentially an allocation of costs, the allocation of costs to current and subsequent periods, the matching of revenues against costs incurred in the production of such revenues, and the allocation of costs to future periods.

(1) Johnson, S.M., "Elasticity of Supply of Milk from Vermont Plants", Vt. Agr. Exp. Sta., Bulletin 480, March, 1942

Herrick (1) believed that standard cost rates would be adaptable in the majority of dairy manufacturing processes and are at least the most convenient and economical bases for using planned performance and controlling of actual production costs.

Thies (2) found that in certain plants there is an overabundance of records. What must be done is to coordinate these records, eliminating all duplications and getting of all information that is necessary. Food industry trade associations have promoted the exchange of cost information on a unit basis such as per 100 pounds or per 1000 gallons.

Schmickly (3) mentioned that in his case, certain control accounts in the general ledger were supported by subsidiary detailed accounts and records. The general accounts of a dairy are similar to those of any general business enterprise, namely, cash book, purchase book, sales book, general journal and general ledger.

The Weber central Dairy Association's (4) operating accounts are set up on a departmental basis and follow the

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(1) Herrick, Anson, "Approaches to Budgetary Control Through Planned Performance", I.A.M.D., Association Bulletin, Vol. 32, No. 15, March, 1940

(2) Thies, John, "Cost Accounting for the Food Manufacturer", Food Industries, Vol. 3, September, 1931

(3) Schmickly, Carl E., "Butterfat Accounting", N.A.C.A., Bulletin Vol 26, No. 11, February 1, 1945

(4) Fuhrimarr, Walter U., Culter, Harold H., and Thomas, W. Preston, "Economic Analysis of the Weber Central Dairy Association", Utah Agr. Exp. Sta., Bulletin 301, May, 1942

techniques of orthodox accounting procedures in allocating costs and calculating net profits or losses for each department. Those incurred wholly for a particular department are charged to that department, and other items are distributed as nearly as possible in conformity with the principle of charging the department responsible for the expense.

Granlund (1) suggested since standard costs furnish performance goals, the effect of the use of this system upon efficiency is important. The standard cost system can be divided into city plant, containers, and selling and delivery.

In Massachusetts (2) general supervision expense of the plant was allocated to departments on the basis of the hours devoted to each department by the other employees.

The fuel used for space heating was allocated to departments on the basis of floor area required for each department. Process steam was prorated on the basis of boiler horsepower required for the number of hours operated and the electricity allocation was based on the horsepower required for the various motors used.

The water used for cleaning purposes was charged to departments in accordance with the floor area needed for the equipment.

(1) Granlund, W.T., "Are Standard Costs Practical in Our Industry?", I.A.M.D., Association Bulletin, Vol. 34, No. 18, 1942

(2) Rittenhouse, C.F. and Co., op. cit.

Expenses of fixed assets were allocated to departments in proportion to the cost value employed in the several departments. In the case of buildings, floor area was the means of allocation.

The International Association of Milk Dealers Accounting Research Bureau have set up a Standard Cost System which may be used for market milk plants. This system is only made available to members of the organization upon payment of a fee for use of the system.

III. DESCRIPTION OF OPERATIONS WITHIN THE PLANT

A. Production Departments

1. Receiving and Sampling

Producers who live within a short hauling radius of the milk plant frequently haul their own milk, but the bulk of the milk is brought to the milk plant by "milk haulers" who cover established routes. This milk can either be delivered to the bottling plant or to a milk receiving station.

The process of receiving the milk at the receiving station or bottling plant consists of transferring the cans from the receiving platform to the dump tank, removing the lids, emptying, and placing the cans on the washer or on a conveyor leading to it. The men who receive the milk inspect it, especially for odors, before it is dumped from the cans. The milk is weighed and a sample taken. Usually the men who operate the trucks place the cans of milk on the platform, but these men are not included in the labor of receiving the milk. After the cans are washed they are returned to the receiving platform and loaded on the trucks.

It is desirable to have the plant so arranged that the milk can be received with as small a labor cost as possible. A rapid system is also desirable so that milk may be handled as fast as it arrives.

Delays permit the deterioration of milk awaiting dumping, increase labor costs, and may increase the operating cost of the can washer. With the use of indicating scales,

semi-automatic sampling devices, and a can washer of ample capacity, the most rapid operation of the incoming milk requires but three men, one to loosen the covers and to inspect the milk, one to place the covers into the washer, dump the milk and place the empty cans into the washer, and one to record the weights and take the composite samples.

Ample, unobstructed conveyor space should be provided for the incoming milk so that the milk may be inspected without delaying operations. There should be generous space near the weigh tank and scale for the storage of the composite samples and for the sampling operations.

In large market milk city areas, receiving stations are used. Milk is received there from the producers in the way described above, thoroughly cooled and is then pumped into tank trucks or tank freight cars to be hauled to the city market. Tank trucks equipped with a trailer commonly haul as much as 30,000 pounds per load. The tank freight cars each contain two insulated large tanks equal to a tank truck.

Most cities now forbid double pasteurization and require that the milk must be pasteurized and bottled within the city. Therefore, the milk must be shipped from the receiving stations to the city plants in a raw state.

2. Storing Raw Milk

From the weigh scales the milk is released by a valve and flows by gravity to a receiving vat. Only a small vat is necessary if provision is made for storage tanks and a pump of sufficient capacity to pump the milk to the storage tanks

as fast as it comes from the scales.

At small plants a large receiving vat may be used and the milk pumped from it direct to the pasteurizing department. A larger receiving vat will be required if a continuous system of pasteurization is used than if the vat system of pasteurization is employed, as in the latter case the milk may go direct to the pasteurizing vats, but with the former system some of the milk must be held in the receiving vat so that a uniform flow to the pasteurizer may be maintained.

At large plants the milk generally goes from the receiving vat to large storage tanks or vats either by gravity or by means of a pump. The pump should be large enough to handle the milk as fast as it is received without being forced and should be of sanitary construction. These tanks are usually insulated or they are provided with an outside jacket in which a cooling medium can be circulated and the milk held at a low temperature. They are usually lined with enamel or other smooth material so that they can be readily cleaned and treated to kill bacteria.

The railway tank cars are unloaded with the aid of pumps or compressed air (filtered) applied to the milk in the tanks and forced into the plant storage tanks.

3. Filtering and Pasteurizing

The plant operations to which the milk must be subjected, preparatory to bottling, should be as follows:

1. Clarifying or filtering, usually preceded by heating to 90° to 95° F.

2. Heating to pasteurizing temperatures
    a. 142° to 145°F. for the holding process in vats
    b. 160°F. or higher by the high-temperature-short-time process
3. Holding the milk at pasteurizing temperature
    a. 30 minutes in vats
    b. 15 seconds in the high-temperature-short-time process
4. Cooling, usually to under 40°F.

Market milk is invariably clarified or filtered by the milk distributor to insure the absence of visible, foreign particles. Clarifying removes suspended, foreign particles by centrifugal, sedimentation, and the ease with which particles settle out will depend upon their size, their density, and the viscosity of the milk. Filtering removes particles by a straining process and if the smallest, visible particles are to be removed, the pores of the strainer must necessarily be small.

The heating and cooling of milk involves special problems and equipment and may be classified into two main types, the holding process and the high-temperature-short-time process.

Where a large volume of milk is to be pasteurized and bottled, it is desirable and economical to have the operations proceed without interruptions. A continuous flow of pasteurized milk to the bottling equipment can be attained by using at least three pasteurizing vats so that 30 minutes are required for filling and heating, 30 minutes for holding, and 30 minutes for emptying. With the operations started 30

minutes apart in the three vats and timed as indicated, the operations may proceed indefinitely in rotation, with but an instantaneous interruption for the closing and opening of valves.

The high-temperature-short-time pasteurizing process has several advantages over the system described above. By the use of regeneration the cost of heating and cooling milk is greatly reduced..

Regeneration is the process of using the heated milk to preheat the cold milk to a temperature of 90°F. This is done by having the incoming cold milk pass through a pipe surrounded by the hot milk. The process provides for continuous operation with limited floor space requirements and is the ideal system for large plants.

For plants using the vat process system the milk must be cooled to 40°F. or under before it is pumped to the bottling department.

4. Bottling

After the milk has been pasteurized and cooled to 40°F. or under, it is automatically filled into clean sterile bottles and they are automatically capped or sealed.

The washing of milk bottles preparatory to filling is one of the important operations in a milk plant. In recent years various "soaker type" washers have come into use and have replaced the "in case" washer.

In the "soaker type" washer the bottles are carried through the washer in racks or carriers which are supported at each end by a sprocket chain. The endless sprocket chains run over and under sprockets in such a manner as to guide the bottles in and out of tanks and through the desired path in the washer. The "in case" washer, on the other hand, washed the inverted milk bottles in the case. These cases weresent by interrupted motion through the washer in which the cases came to successive stops over jet plates which would force a spray of water, alkaline solution and finally hot water into the bottles.

These modern washers undertake to wash, sterilize, and cool the bottles so that they can pass directly to the bottling machine without rehandling. Since the heating and cooling must be gradual to avoid breakage, this constitutes a problem, which is met by using lower tempertures than were used to sterilize bottles

in the "in case" washers. For sterilizing reliance is placed upon the alkalinity of the washing solution, the longer time of exposure to this alkalinity, and in some cases rinsing with chlorinated water.

The milk bottles are automatically fed into the bottle supports of the filling machine so that its mouth is pressed against the soft rubber gasket of the filling nozzle. Milk flows into the bottle while it is travelling with the assembly. Just before the bottle is removed a cap is placed on top and the bottle sent automatically to the hood machine. This machine places the waxed hood over the bottle which protects the pouring lip from contamination.

5. Storing Finished Product

The filled and hooded bottles should be inverted for rapid inspection as they are placed into the bottles cases. Against the white background of milk, bottle defects frequently show up, which escape attention when the bottle was empty. In certain plants the filled and capped bottles are passed under a shower of clean fresh water to rinse away any milk from the outside of the hoods and bottles.

The milk cases are stacked in an orderly manner, so planned as to facilitate loading of the delivery wagons early in the morning. The milk should be stored at temperatures of from 35° to 40° F. The cases are sent by conveyors to waiting delivery trucks and the manufacturing cycle of processing milk is completed.

B. Service Departments

1. Factory Management Department

This department lays out the work for the market milk plant in its proper sequence, issues orders to the purchasing department for materials and supplies. The head of the department issues orders to the maintenance department for equipment repairs.

This is the department which assigns the men to the work to which they are best qualified to perform and sees that the plant is run without interruptions. The department is responsible for the production and quality of product turned out by the plant.

2. Heat and Power

In the Market Milk Industry large quantities of hot water and steam are needed to wash and sterilize dairy equipment. In most large plants the engineer is responsible for supplying this need and is also required to tend the ice machines which are always near the boiler-room.

The head of this department is responsible to the factory management department for the required heat and steam to run the plant and to maintain enough refrigerating to keep the perishable finished product at the proper temperature.

3. Laboratory

The laboratory of a market milk plant must exercise close supervision over the quality of the products and efficiency of various operations due to the rigid Board of Health regulations. This department is so important some authorities

would classify it as a production department.

All milk received by the plant is tested for fat content in accordance with State regulations. Samples are run on the producer's raw milk for bacterial content, types of bacteria, and sediment tests. Tests are run on storage tanks to see that the milk is up to the required fat percentage before it is pasteurized.

The finished product is tested for pasteurizing efficiency, cream line observations, presumptive test for Escherichia coli, fat percent, acid, flavor and various other tests such as, whether the bottle is properly filled, tests to detect ropiness, etc.

Tests should be made on alkalinity of solutions used for washing bottles, available chlorine used in sterilizing solutions and many other practical tests such as hardness of water used in the boiler, freezing point of the brine used in the refrigeration system,etc.

The above reports must be sent to the factory management department immediately after completion so that any variations from proper standards can be remedied.

4. Maintenance

This department is responsible for the care and maintenance of equipment. Equipment must be properly cared for and major repairs made when the plant is not in operation. This department should organize a well devised plan of preventive maintenance in order to prevent costly break down of

equipment during the regular operating period of the equipment.

5. Personnel

This department should prepare a classification of jobs as either direct labor operations or indirect labor functions. The company employees are thus classified in groups for which rates of pay are established.

The personnel department supervises the preparation of the various employee's records. These records begin with the interview with each applicant applying for a position. An application blank is filled out which includes age, physical characteristics, education, previous training and experience. When the medical examination is given it is filled with the application blank.

The department should try to keep labor costs to a minimum by following up and endeavoring to reduce lateness, absenteeism, and to reduce accidents and fatalities among the workman.

6. Purchasing

From a cost point of view the purchasing department performs the function of purchasing all of the materials and equipment used by the plant. The purchasing agent should keep in close touch with the various markets which offer the materials used in the factory. He must know the annual and seasonal material requirements for his company, and should anticipate increases in future prices and order quantities

accordingly.

Requisitions for materials, supplies, and repairs parts are sent by the various department head to this department for purchasing. The purchasing agent must also order in accordance with the specifications prescribed by the individual responsible for making the specifications.

7. Storeroom

The head of the stores department is the storekeeper. He is responsible for maintaining the proper quantity of store items in stock, and for protecting the stores from theft and from issuance without a properly prepared stores requisition.

The stores departments fits into the company organization in either of two ways. The storekeeper may report to the purchasing agent but more generally he is under the jurisdiction of the factory manager.

This department must keep a perpetual inventory record of all stores and take a physical inventory at periodical intervals. A code classification for all store items should be provided regardless of the number of items carried in the storeroom. The code can be designed to cover the major classifications with individual numbers for each item stocked under the major groups.

8. Timekeeping and Payroll Department

The object of this department is to prepare and keep accurate records of the personnel employed by the business enterprise including type of work, hours, days of work, rate of pay, and amount of salary or wages paid. Such a record tends

to prevent padding of payrolls and provides complete information concerning each employee.

The proper classification of labor costs within the milk plant should be made and the information sent to the cost department.

Information required for governmental reports such as those in compliance with the social security program should be assembled. The payroll records should be kept in such a manner that all governmental reports can be readily and easily prepared at the proper time.

9. Cost Department

This department takes care of all accounting which effects the processing of market milk. Estimates are prepared of the cost of operating and they are compared with the actual costs.

The department supervises the stores inventory ledger records pertaining to the receipts, issued, and balance of all store items. It should maintain an up-to-date price record of all items kept in the storeroom by revising the unit prices of any items when the purchase invoice prices indicate the necessity for their revision.

This department prices the stores requisitions and makes the necessary extensions and totals. It prepares cost summaries showing cost of materials and supplies used.

The cost department prepares all the factory journal and ledger entries from information received from the various

other departments and is responsible for making up the monthly and annual balance sheets and profit and loss statements.

IV. COST ACCOUNTS

Cost accounts which concern themselves with manufacturing operations constitute a method of determining the production cost of an article or a group of articles to be manufactured. In order to achieve and maintain financial equilibrium the management of an organization must be kept informed on manufacturing costs in all its detail by the use of cost accounts.

Cost accounts are compiled for factory operations where as the business accounts, the asset, liability and capital accounts, relate to the financial position of the company. They have as their main object the analytical determination of manufacturing costs.

Wise (1) was of the opinion it was essential that cost accounts and cost records should be prepared in a manner which will permit simple comparison and checking with the financial accounts although no entry in one set of books will call for transfer to the other.

A. Accounting Code Systems

Instead of writing an account title which may be mispelled or improperly classified because of its technical nature or of carelessness, it is usually more convenient to use a code system. The main reason for a code system is secrecy. Management frequently considers it a poor policy to permit

(1) Wise, K. Bearnard, "The Chartered Accountant in Australia", The Accountants Digest, Vol. 8, No.3, March, 1942

the general office employees to know the nature of purchase, labor, and expense transactions which are summarized in the general and subsidiary ledgers.

A transaction may be analyzed and coded by either the comptroller or accountant when a code system is in force. Usually the comptroller retains a complete classification of accounts and supplies each department head with the accounts and code which relate to his particular work.

Van Sickle (1) suggested that the code system must have enough elasticity which would permit the adding of new accounts, departments, cost centers, equipment, etc., without disrupting the already general group and specific code numbers.

Blocker (2) found the most commonly used plans of coding accounts were four, namely, the numerical system, the decimal system, the mnemonic system, and a combination letter and number system.

B. Production Division Cost Accounts

The production cost accounts are used to record the transactions arising from the operation of the manufacturing division. This group of accounts indicated the manufacturing operations and the accounting cycle from the

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(1) Van Sickle, C.L., "Cost Accounting Fundamentals and Procedures", Harper & Brothers Publishers, New York, 1938, pp. 89-90

(2) Blocker, J.G. op. cit., pp.12-17

original material, labor, and manufacturing expenses through the cost of goods sold.

These manufacturing accounts are closely associated with certain forms, subsidiary ledgers, special journals, and other records which will be discussed in subsequent sections of this thesis.(1) Since cost accounting work involves a large number of detail accounts, controls over the various groups of these accounts can be established by means of controlling accounts.

1. The Stores Inventory Account

The stores inventory account is operated as a perpetual inventory account. It reflects the cost of the raw materials and supplies received and issued by the stores department.

The account is debited for the purchase of raw materials and supplies from vendors, the freight on incoming materials and supplies which can be identified expediently with specific store items received, and scrap materials, which are kept until disposed of through the sale of scrap.

The account is credited for the raw materials and supplies requistioned for the various production department and supplies used within the service departments as well as supplies returned to vendors.

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(1) See Section V, pages 53, 56, and 57; Section VI pages 79 and 80; Section X, pages 111 and 112

The balance of the stores inventory account is used in preparation of the production cost and financial statements. It also provides a figure used in proving the stores ledger which is the auxiliary record controlled by the stores inventory account.

2. The Direct Material Used Account

The direct material used account is not always found in a cost system. However, this account records the cost of the direct materials charged into production during the cost period.

A debit for the summary of the materials requisition from the storeroom or from other sources for use in the production departments is made each month. This summary is prepared from a material used summary sheet. The account is credited for cost of direct materials charged into the work-in-process account at the end of each month.

3. The Direct Labor Account

The function of the direct labor account is to record the amount of the cost element, direct labor, that is costed into production each month.

A debit each month for the amount of the direct labor charges as ascertained from the factory labor distribution sheet is made and a credit for the direct labor cost charged into the work-in-process inventory account.

4. The Overhead Expense Account

All manufacturing costs other than direct materials and direct labor comprise the factory overhead. Separate

accounts should be opened for the various manufacturing items. At the end of a period these are summarized in a factory summary account to determine total indirect manufacturing costs. Overhead shows the total charges for indirect labor, indirect materials, building and machinery depreciation, maintenance and repairs, power, taxes, insurance, etc.

The indirect expenses are debited to the account and a credit for the overhead expenses is charged into the work-in-process summary account at the end of the accounting period.

5. The Work-in-process Summary Account

This account is classified as a production cost account because all of the cost elements applicable to production are charged thereto. This account may be set up on a departmental basis, that is, instead of a single account, there is a separate account for each department. Departmental work-in-process accounts make possible a better verification of the account balance with its auxiliary records, and provide a better analysis of the production cost in process.

The account is debited for the direct material used in or charged into production during the period, the direct labor costed into production, and the overhead expense charged into production each month.

The cost of completed units transferred to the finished goods account are credited to this account as well as the sale of spoilage and scrap which has been transferred to the storeroom.

C. Transitional Cost Accounts

These accounts summarize the cost of the products which are now turned over to the sales department for selling and to the general accounting office for addition of selling and administrative expenses.

1.. The Finished Goods Inventory Account

This account lists all the cost of the completed . articles manufactured during the accounting period minus those which have been transferred out of the plant.

The account is debited for the cost of completed products transferred from the manufacturing division and the cost of units returned by customers which are resalable.

The balance is used in the computation of the cost of goods sold in the preparation of the profit and loss statement for the month.

2. The Cost of Goods Sold Account

The function of the above named account is to show the cost value of the finished goods which have been sent from the plant. This is the last account in which production costs are directly reflected, in the sequence of accounts beginning with the stores inventory. In this flow of accounts the cost of goods sold and cost of returned shipment accounts are the end point.

The cost of finished goods shipped is debited and the account is credited for the total accumulative cost of

goods sold at the end of the fiscal year, when the closing of all of the operation accounts is made to the profit and loss account.

3. The Cost of Returned Shipments Account

This account may or may not be used in the cost system. It records the cost of returning defective goods to the vendor's plant which will eventually be allowed as a credit against future orders when the negotiations for adjustments and returns have been completed.

D. Control Account Between Factory Office and General Office

A cost system is often designed so as to segregate the production cost accounts from the general accounts. This may be for two reasons, first, the factory may be located at some distance from the office where the general books are kept and the second, the controller considers it advisable to exclude the cost detail from the general books as a means of localizing responsibility for the handling of production costs.

A control account is called factory account on the general accounting records and general office account on the factory books is used to transfer funds and keep the two sets of accounting records in balance. The transfer voucher should be used which is equivalent of a letter from the main office or from the factory office, stating that the factory or general ledger account has been debited or credited with the information on and amount of the voucher. By using the voucher system the books should always be in balance.

V. BOOKS USED IN OPERATION OF THE COST SYSTEM

A. Books of Original Entry

Accounting systems are sometimes noted for their lack of uniformity. Even where a trade association has adopted a uniform cost accounting system, each member will use a great variety of forms, journals, and ledgers. Under these circumstances it is a difficult problem to present a set of books to be used by different plants in their cost systems. In this thesis only the basic books necessary for a cost system will be mentioned.

1. General Journal

The nature of the production cost transactions which are entered in the general journal will depend upon the cost system design and the cost procedure. Noble, Karrenbrock, and Simons (1) mentioned that the general journal is used largely for correcting, adjusting, closing and reversing entries which cannot be recorded in the special journals.

A journal entry arranged according to the standard form carries a record of each transaction as a unit. This form must consist of at least two columns, a debit column and a credit column, and as many more as is necessary for the cost system. By the use of more than two columns a vast amount of posting labor in the transfer of the data to the ledger can be saved if you have recurring entries to enter.

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(1) Noble, H.S., Karrenbrock, W.E., and Simons, H., "Advanced Accounting", South-Western Publishing Company, Cincinnati, 1941, pp.33

2. Voucher Register

The voucher register is mainly used to enter transactions that arise in connection with vendors and to set up the liablility for the payment of the payroll, etc. Rorem and Kerrigan (1) believed that the voucher register is a specialized journal which could also perform the function of several special journals, It could remove the need of a separate purchase journal and reduce the function of the cash disbursements journal to the point where it is merely a list of checks issued.

Essential to a good internal control system is where contracts and purchase orders that are being prepared and large sums disbursed, the checking and authorization of such business transactions should be done by a large number of clerks and officials. The voucher system is a good method of handling, recording, and paying obligations through the use of vouchers which have been officially approved.

A distinctive feature of this system should be the requirement that all disbursements must be made by checks properly supported by approved vouchers. Vouchers are business papers which contain the salient fact of the transactions and with an authorized signature for payment.

(1) Rorem, C.R. and Kerrigan, H.D., "Accounting Method", McGraw-Hill Book Company, Inc., New York, 1942, pp.17

The voucher may represent a single invoice or may include a number of invoices payable to the same creditor. A different voucher must be prepared for each obligation which is entered as a separate charge in the voucher system. Initials of representatives of purchasing, receiving, testing, and accounting departments should be recorded on the invoice as it is checked in the individual departments. Thus, the assembly clerk who prepares the vouchers knows that the materials or services were properly requisitioned, received, inspected, and priced.

The voucher with its supporting papers must be checked for mathematical accuracy. Vouchers for purchases should contain the signatures of the purchasing agent, person responsible for initiating the requisition, and an official of the cost department. The cost department inserts in the distribution section the controlling account or accounts to be charged when the obligation is entered in the register. This can be done by account titles, code symbols, or both as have been previously mentioned.(1)

Payrolls which are prepared and checked by the payroll department should be attached to the payroll voucher and approved by the paymaster, department heads responsible for the work done, and head cost accountant who analyses the payroll on the basis of direct or indirect charges.
Vouchers for current expenses such as utility bills, rent, repairs, etc., must be approved by department heads before

(1) See Section IV, Accounting Code Systems, pp.43

EXHIBIT A

VOUCHER REGISTER

DATE	EXPLANATION	VOUCHER NO.	PAID		ACCOUNTS PAYABLE CR.	RAW MILK DR.	SUPPLIES DR.	DIRECT LABOR DR.	MANUFACTURING EXPENSES DR.		SUNDRY		
			DATE	CHECK NO.					CODE	AMOUNT	L F	ACC'T DR.	AMOUNT

being entered in the voucher register.

As illustrated in Exhibit A the voucher register has three important sections:

1. Description section which includes date, explanation, and voucher number.
2. Paid section showing check number and date of payment.
3. Acounting distribution section which includes columns for credit and debit of specific and sundry accounts.

When goods have been returned to the vendor for credit after the voucher has been entered in the gefister, before payment has been made either the voucher can be cancelled and a new one issued or a correction made. Corrections can be made in red ink immediately above the entries in the voucher payable credit column and the debit in the column used by the voucher being corrected. Cancelled vouchers are treated in the same matter but it must be remembered that the red ink figures equal the original entries in amount.

3. Cost Journal

The cost journal is used to enter production cost transactions that arise during the month within the manufacturing departments and cost centers. This journal may also be known as a standard journal as the journal entries do not vary a great deal from month to month. The journal should contain four columns for each month, two columns a debit and

credit to be posted to the general ledger and the other two columns also a debit and credit to be posted to the subsidiary ledgers.

Such entries as stores used, labor transfers, labor distribution, overhead distribution, finished goods inventory transfer, etc., would be found in this journal.

4. Cash Receipts Journal

All cash received by the plant is entered in this book. Most of the entries would be booking the cash received from the administration office of the company. However, cash received from the sale of scrap and returned products would be listed in this book.

5. Cash Disbursements Journal

All cash payments are recorded in this journal. Inasmuch as the plant uses a voucher system whereby all disbursements are authorized by vouchers that are entered in the voucher register, only one debit column, voucher payable, is necessary. The journal must include a credit column for purchase discount and the net amount of cash paid out on each transaction. The totals of each column at the end of the month are posted to the accounts in the general ledger.

EXHIBIT B

CASH RECEIPTS JOURNAL

DATE	EXPLANATION	L F	CASH DR.	RECEIVED FROM HEAD OFFICE CR.	ACCOUNTS PAYABLE CR.	GAIN ON FACTORY SCRAP AND RETURNS CR.	SUNDRY	
							ACCOUNT	AMOUNT

EXHIBIT C

CASH DISBURSEMENTS JOURNAL

DATE	PAYEE	VOUCHER NO.	CHECK NO.	L. F.	ACCOUNTS PAYABLE DR.	PURCHASE DISCOUNT CR.	BANK CR.

B. Books of Secondary Entry

Certain of the controlling accounts mentioned in section four are supported by secondary or subsidiary ledgers.(1) The ledgers show in detail certain main facts which are shown in summary in the factory ledger.

1. Factory Ledger

The regular double entry ledger ruling as illustrated is used for the factory ledger. The factory ledger should contain all of the production cost accounts, finished goods inventory, and all other accounts used in the cost system.

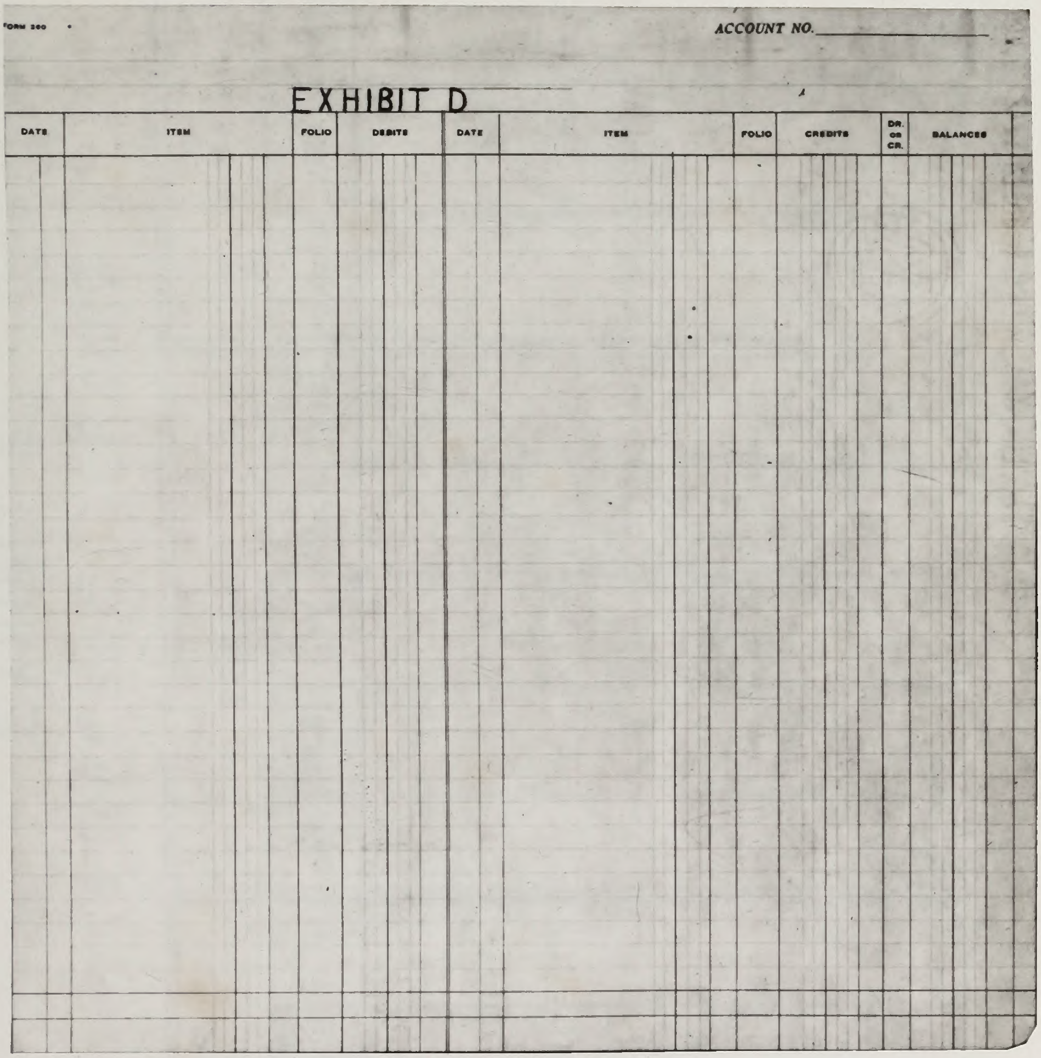
Accounts follow each other in the ledger according to a sequence decided in advance. Assets accounts should occupy the first part followed by liability accounts and ending with the income and expense accounts. It should be noted that this sequence has the advantage of placing together in the ledger data which will be used in the preparation of financial statements.

2. Stores Ledgers

The stores ledger card is one of the basic records in cost accounting and is prepared by the stores clerk. The illustrated form provides for the quantity and price of the material received, the quantity and price of material issued, and the quantity and price of material on hand.

The stores ledger is controlled by the stores in-

(1) See Section IV Production Division Cost Accounts pp. 44-47



FORM 260

ACCOUNT NO.____________________

EXHIBIT D

DATE	ITEM	FOLIO	DEBITS	DATE	ITEM	FOLIO	CREDITS	DR. OR CR.	BALANCES

EXHIBIT E

STORES' LEDGER CARD

RECEIVED					ISSUED					BALANCE			
DATE	PUR. ORDER	QTY.	PRICE	TOTAL	DATE	REQ. NO.	QTY.	PRICE	TOTAL	DATE	QTY.	PRICE	TOTAL

ventory account in the factory ledger. At any time the sum of the balances on each stores ledger card should equal the balance as shown in the factory ledger.

The direct material used account is supported by the producers stores ledger which states the amount of milk received from each producer each day as well as the fat test which is required to be made twice each month.

3. Finished Goods Ledger

This ledger is controlled by the finished goods account in the factory ledger. The purpose of the finished goods ledger is to keep a perpetual inventory record of each item of milk shipped each day.

There are many forms of the finished goods ledger varying chiefly as to size and ruling. Its principal feature is that of recording the quantities produced and shipped and the balance on hand each day. The finished goods ledger may be kept on a basis of unit quantity only or upon the combined plan of unit quantity and inventory valuation.

EXHIBIT F

PRODUCERS STORES LEDGER

NO.	NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		TOTAL WEIGHT OF MILK	FIRST TEST	SECOND TEST	AVERAGE TEST	POUNDS BUTTER FAT	AMOUNT PAID
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						

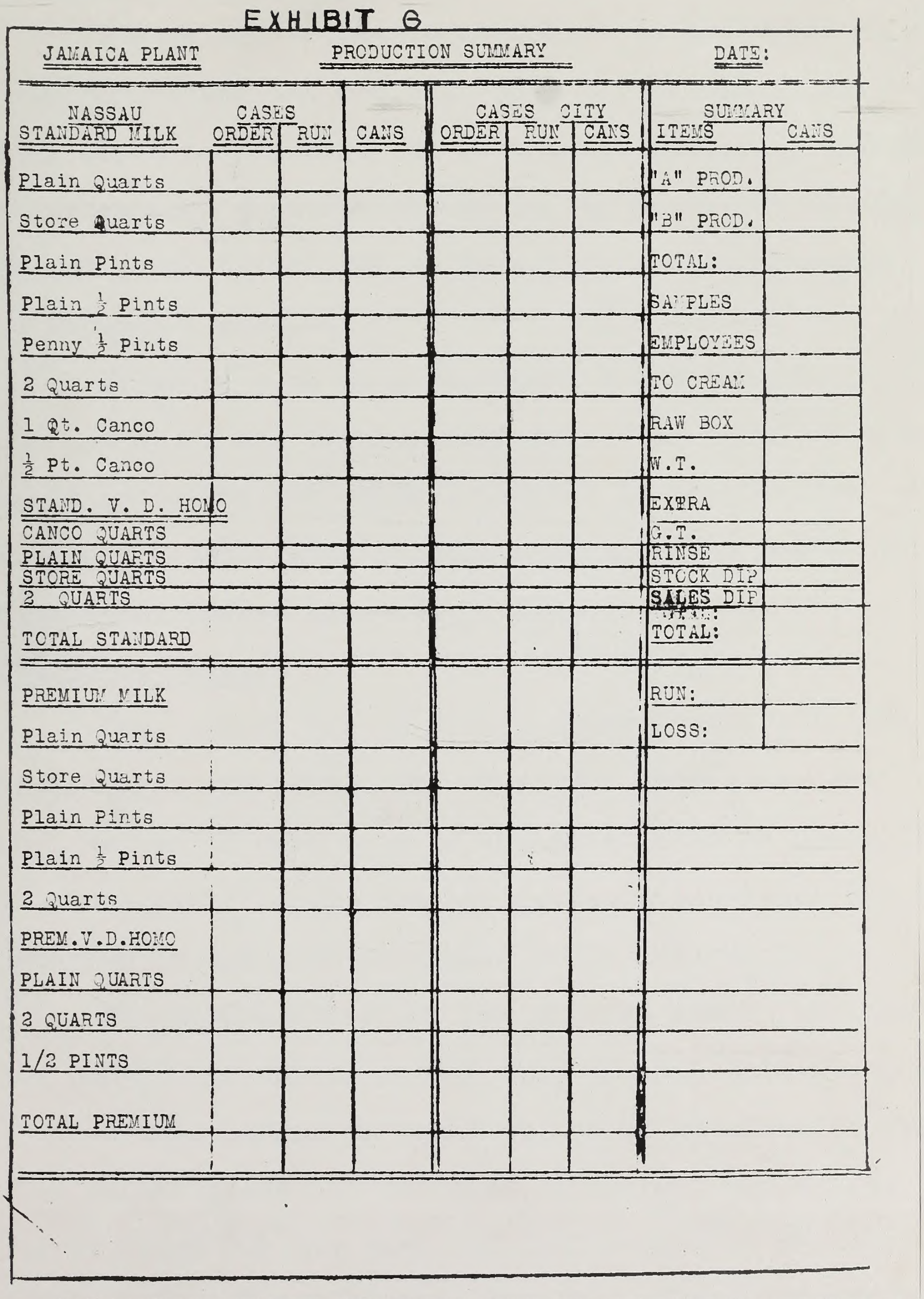


EXHIBIT 6

JAMAICA PLANT — PRODUCTION SUMMARY — DATE:

NASSAU STANDARD MILK	CASES ORDER	 RUN	CANS	CASES ORDER	CITY RUN	 CANS	SUMMARY ITEMS	 CANS
Plain Quarts							"A" PROD.	
Store Quarts							"B" PROD.	
Plain Pints							TOTAL:	
Plain ½ Pints							SAMPLES	
Penny ½ Pints							EMPLOYEES	
2 Quarts							TO CREAM	
1 Qt. Canco							RAW BOX	
½ Pt. Canco							W.T.	
STAND. V. D. HOMO							EXTRA	
CANCO QUARTS							G.T.	
PLAIN QUARTS							RINSE	
STORE QUARTS							STOCK DIP	
2 QUARTS							SALES DIP	
TOTAL STANDARD							TOTAL:	
PREMIUM MILK							RUN:	
Plain Quarts							LOSS:	
Store Quarts								
Plain Pints								
Plain ½ Pints								
2 Quarts								
PREM.V.D.HOMO								
PLAIN QUARTS								
2 QUARTS								
1/2 PINTS								
TOTAL PREMIUM								

4. Overhead Expense Ledger

The actual manufacturing expenses are those which are incurred during the period. They may be set up as individual expense accounts. In most large concerns, a manufacturing expense control account is set up on the factory ledger and a subsidiary ledger is maintained for certain of the expense accounts.

By using such an arrangement a special column must be set up in the voucher register. The total of the column is posted to the control account in the factory ledger and the individual expense amounts being posted to the subsidiary ledger accounts.

5. Equipment Ledger

This ledger has no direct relationship with the production cost accounts. The equipment ledger records the cost values of each unit of equipment used in production and it also specifies the monthly depreciation rates for each unit charged in the cost journal.

The equipment ledger may provide space for listing the monthly or annual repair cost of each unit of equipment. From this ledger information can be obtained to show when the repair costs are becoming excessive, and can be used as an index for the need for replacement of the equipment units. The repair cost is merely a summary of maintenance costs collected by the cost system and recorded for managerial inspection.

EXHIBIT H

OVERHEAD EXPENSE LEDGER

ACCOUNT				NO.	
DATE	L.F.	DR.		CR.	

Irwin (1) suggested this ledger should contain name, description, identification numbers and marks, name of makers, serial numbers, size, capacity, and speed of the machinery listed. Data relating to initial cost, purchase price, or construction costs plus installation, additions, and betterments should also be listed in the ledger.

C. Accounting Manual

An accounting manual is the book of instructions pertaining to the operation of the accounting system. It should perscribe the method and procedure for handling the accounting transactions from the time they originate until they are finally disposed.

The purpose of the accounting manual is to provide a set of standard instructions for the operation of the accounting system. A standard procedure will mean uniform cost reports and general accounting statements so that comparisons can accurately be made. New employees may be hired and old ones transferred to new jobs, but with an accurate manual the handling of the accounting procedure is made much easier.

Lang (2) believed the manual should also include summarizing and closing schedules and procedures, methods of analysis of operation items, and indicating departments responsible for preparation of special reports.

(1) Irwin, L.W., "The Plant Register as an Aid to Efficiency", The Accountants Digest, Vol.9, No.4, June, 1944

(2) Lang, T., "Cost Accountants' Handbook," The Ronald Press Company, New York, 1944, pp.171-214

VI. MATERIAL COSTS

A. What are Material Costs?

There are two types of material costs, direct and indirect. Direct material cost is the value of the raw materials charged into production. It is the amount that can be measured accurately and conveniently for each unit of production. Indirect material cost, an item of overhead expense, is the value of supplies used in the operation and maintenance of the plant. This amount cannot be allocated to a unit of production.

B. Objectives of Raw Material Accounting

Lawrence (1) emphasized the principles of material accounting to be, transactions involving the purchasing, receiving storing or consumption of materials which should be based on written orders duly authorized by an executive. All materials not immediately required in manufacturing should be stored under proper supervision in a safe place. At least two persons should be concerned in all transactions involving materials in order to prevent fraud or theft except by collusion.

Dohr, Ingrhram, and Love (2) believed the objectives of raw material accounting should be to keep a continuous

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(1) Lawrence, W.B., "Cost Accounting", Prentice-Hall, Inc., New York, 1931, pp.97-99

(2) Dohr, J.L., Inghram, H.A., and Love, A.I., "Cost Accounting Principles and Practice", Ronald Press Company, New York, 1935, pp.156-162

record of goods on hand, to keep a record of purchases and of goods received at cost, to locate goods in the storeroom, and to measure the efficiency of materials used through the setting of standards.

C. Material Costs and Service Departments

1. Purchasing Department

The purchasing department may operate either as a separate service department or as a part of the administrative division, depending upon the size of the enterprise and the value to the organization.

From a cost standpoint this department purchases all materials and equipment used by the plant. Lewis (1) stated this department may also be responsible for stores and storkeeping, inventory control, receiving, inspecting, traffic, research and engineering, and salvage disposal.

This department may keep the inventory records and order the necessary supplies when the order point is reached. It is the department's duty to keep a list of responsible vendors on file for each article purchased. When purchasing costly equipment estimates from more than one company must always be obtained.

(1) Lewis, H.T., "Industrial Purchasing Principles and Practice", Richard D. Irwin, Inc., Chicago, 1942, pp.24

2. Store Department

All stores issued to the various departments upon the required requisitions should be done by the storekeeper. This department must also take the physical inventory and keep the book inventory. Before the supplies are placed in the storeroom they must be inspected.

If stores are not stored away in an orderly fashion the resulting confusion in issuing materials may delay the flow of production. Also store items may be ordered and the inventory needlessly increased because the quantity on hand was reported inaccurately when the purchase requisition was placed.

By not properly maintaining the stockroom, supplies may be lost or taken without a stores requisition which means an inventory shortage and increased production cost. A code classification for all store items should be provided. This code can cover the major divisions, with individual numbers or letters for each item under the main heading. By the use of a code the handling of requisitions is made much simpler. Each article kept in the storeroom should have a place assigned where it should always be placed when new lots are received.

The storeroom should be located where it is easily accessible for the delivering of stores and also accessible to the production and service departments. Authority to issue requisitions for materials should be limited to the heads of departments. The strictness with which manage-

ment restricts this authority is reflected in control of the stores inventory and in decreased production costs through the reduction of inventory shortages.

D. Proper Stores Control Upon Production Costs

Differences between the book and physical inventory may be due to four main causes: failure to receive store requisitions for issued items, issuance of larger quantities than called for, posting to wrong ledger card, and errors in pricing and extending inventory.

The numbering or stores requisitions serially tends to safeguard production costs against lost requisitions and resultant understated material costs. When inventory is maintained at the proper level this can lower production costs because it insures a constant and adequate stock without extreme losses due to obsolescence.

In the milk plant the largest cost of raw materials is for raw milk, therefore, accurate milk and butterfat losses throughout the plant must be kept. By the use of EXHIBIT I the plant manager is able to prevent frequent recurrence of butterfat losses which greatly increase cost of operation.

EXHIBIT I

CONTROL OF MILK AND BUTTERFAT LOSSES

DEPARTMENT	RECEIVED	SENT OUT	DIFFERENCE IN QUARTS	LOSS IN POUNDS OF BUTTERFAT	LOSS IN DOLLARS		REMARKS
RECEIVING							
STORING-RAW MILK							
PASTEURIZING							
BOTTLING							
STORING-FINISHED PRODUCT							

E. Duties of the Cost Department

This department supervises the keeping of the stores inventory auxiliary ledger records pertaining to the receipts, issues, and balances of each item. It should maintain an up-to-date price list and make the necessary extensions and totals on all stores requisitions.

The department prepares the monthly adjusting entry for the estimate loss in the stores inventory resulting from theft, carelessness, etc. From past experience can be estimated the extent of the difference between the book and the actual inventory. By preparing monthly adjusting entries for a proportionate amount of the total annual estimated loss, it is possible to spread the loss over each month's operations. The amount is credited to the reserve account which is debited with the actual total loss at the end of the year.

Producer's accounts are kept for each patron sending milk to the plant. When the butterfat test is received the amount due each patron is figured and then the necessary expense voucher is drawn up for the producer's payroll. Producer's payroll (1) in cooperative creamery accounting is the amount of money paid members for raw milk purchased

(1) Brubaker, Delmer D., "Cooperative Creamery Accounting", Farm Credit Administration, Washington, D. C., Bulletin No. 39, June, 1939

An illustration of this type of form has appeared in section V of this thesis as Exhibit F.(1)

F. Purchase Discounts

Purchase discounts refers to cash discounts allowed on the purchase of materials and supplies to be used in manufacturing. There are several different methods for handling purchase discounts. The first method is to deduct the amount of the discount from the invoice and enter the materials at net cost on the books. The main disadvantage of this method is the uncertainty whether the bill will be paid on time to acquire the purchase discount.

The most common and practical method when using a voucher register system is to take the discount when the invoice is paid within the time limit and charge the discount to "purchase discount account" in the check register. The invoice is entered in the voucher register for the full amount.

G. Store Inventory Shortage

Whenever an adjustment is made to the stores inventory control account for shortage the auxiliary ledger records must be brought into agreement.

Church (2) stated that waste is not the same as spoilage, though the line is hard to draw. Spoilage is said

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(1) See Section V, Finished Goods Ledger, pp. 62

(2) Church, A.H., "Manufacturing Costs and Accounts", McGraw-Hall Book Company, Inc., New York, 1917, pp. 86-99

to be always accidental while waste arises out of the manufacturing operations and can be foreseen.

In the milk plant waste occurs by reason of shrinkage of materials due to evaporation of the product and due to certain amount always left in tanks, pipe lines, fillers, etc. Special reports have been designed which try to keep this loss of butterfat to the absolute minimum.(1)

H. Adjustment for Obsolete Materials

When the physical inventory is taken the stores inventory should be inspected to determine the existance of obsolete items. Items which have not been used for a year or more should be disposed upon approval of the management.

Adjustment must be made on the stores ledger records and stores inventory control account when obsolete materials are sold. The nature of the entry will depend upon whether a reserve for obsolescence cost. Where no reserve has been set up for inventory shrinkage the obsolescence cost at the end of the fiscal year is charged to an expense account and credited to stores inventory account.

(1) See Section VI, Control of Milk and Butterfat Losses pp. 71

VII. LABOR COSTS

A. Meaning of Labor Costs

Labor costs represent the expenditures for wages and salaries payable to the personnel engaged in the production of bottles fluid milk. Labor costs may be classified under two general groups, direct labor and indirect labor.

Direct labor is treated as an element of cost to the product. It is the amount of wages paid the personnel for manufacturing operations which can be allocated directly to the units produced. The nature of operations will determine the direct labor charges.

Indirect labor, on the other hand, is considered as an overhead expense item because it is the wages paid for work which indirectly effects production. This wage group cannot be allocated with accuracy to the units produced. A list of these jobs was given in section three of this thesis.(1)

B. Labor Costs and the Service Departments

1. Personnel Department

It is the duty of this department to list what jobs in the plant will be classified as direct and indirect. This department must set up rates of pay for different classes of jobs.

In Massachusetts most fluid milk concerns pay on an

(1) See Section III, pp. 37-42

hourly basis while in the Mid-West States they still maintain a weekly wage schedule.

The personnel department should be required to keep a complete record on each employee. This would be the original application of the employee as well as his frequent medical examination reports as required by the Board of Health. Promotions and salary increases should also be noted.

Ways and means of reducing labor costs should be set up. This may be accomplished by assigning the best qualified man to a postion which is open, by reducing sickness, training the workman for his particular job and interviewing workmen who are leaving to find ways of cutting down labor turnover.

2. Payroll Department

This department must keep an accurate record of each employee's earnings as well as make the necessary deductions for tax purposes.

a. Checking workmen in and out of the plant

At the employees entrance of the milk plant should be placed the time clock and cards showing the names and number of each workman arranged in wall racks. Dohr, Inghram, and Love(1) suggested all employees except important employees and officials should be required to "puch the time clock".

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(1) Dohr, J.L., Inghram, H.A., and Love, A.I., op.cit, pp.309-311

The "in and out" cards show the total time spent in the factory per day. By use of the time card lateness and absenteeism may be checked. It has been suggested that the time clock be arranged to punch lateness in red figures rather than black or blue. At regular intervals reports should be sent to the factory management office on the amount of lateness and absences shown on the cards.

b. Checking presence of workmen

A double check on the presence of workmen is to have the foreman or timekeeper tour the plant each day to verify the markings on the time cards. Blocker (1) stated this would tend to limit the padding of payroll hours.

c. Keeping records of wage rates

The payroll department must have a record of the wage rate to be paid each employee. These records must be accurate and always kept up-to-date. Laing (2) believed that in a standard cost system overtime rates be taken into consideration before variances are set up by this department.

d. Preparation of factory payroll records

When the wage payment is on the hourly rate, the total daily hours worked are totaled and entered on the payroll form. When the total hours worked by each man is multiplied by his rate, his gross income is shown on the

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(1) Blocker, J.G. op. cit., pp. 100-122

(2) Laing, W.J., "How Should Expense be Apportioned Between Civil and War Production?", The Accountants Digest, Vol. 9, No. 3, March, 1944

form. Under the deduction section are columns for bonds, old age tax, withholding tax, insurance, milk products deduction, etc. When the total deductions are subtracted from the gross income the net income or take home pay for each employee is obtained.

There are several types of payroll forms which may be used. The one illustrated covers all the points which have been mentioned.(1)

e. Preparation of individual earnings records

It is the duty of the payroll department to compile a record of the total earnings of each employee. ✓ A copy of this record must be given to each employee upon his leaving the company's employment or at the end of each calendar year. This record book becomes the basis for the Federal Internal Revenue Form 1099 which must be filled out.

f. Preparation of factory payroll

Another function of this department is the payment of wages. The net earnings of each workman as shown on the payroll record book is the basis for preparing the cheques. It is recommended that a special bank account be set up for the payroll. A voucher is made out for the desired amount and entered in the Voucher Register and a cheque drawn. This check is deposited in the payroll account and employees cheques issued against this special account.

(1) See Section VII, Payroll Summary, pp. 79

EXHIBIT J

PAYROLL SUMMARY

CLOCK NO.	EMPLOYEE NAME	RATE	TOTAL HOURS	EARNINGS			DEDUCTIONS							NET PAY
				REGULAR	OVERTIME	GROSS PAY	F.O.A.B.	WITH-HOLD TAX	INS.	WAR BONDS	DAIRY PRODUCT	MISC.	TOTAL DEDUCTIONS	

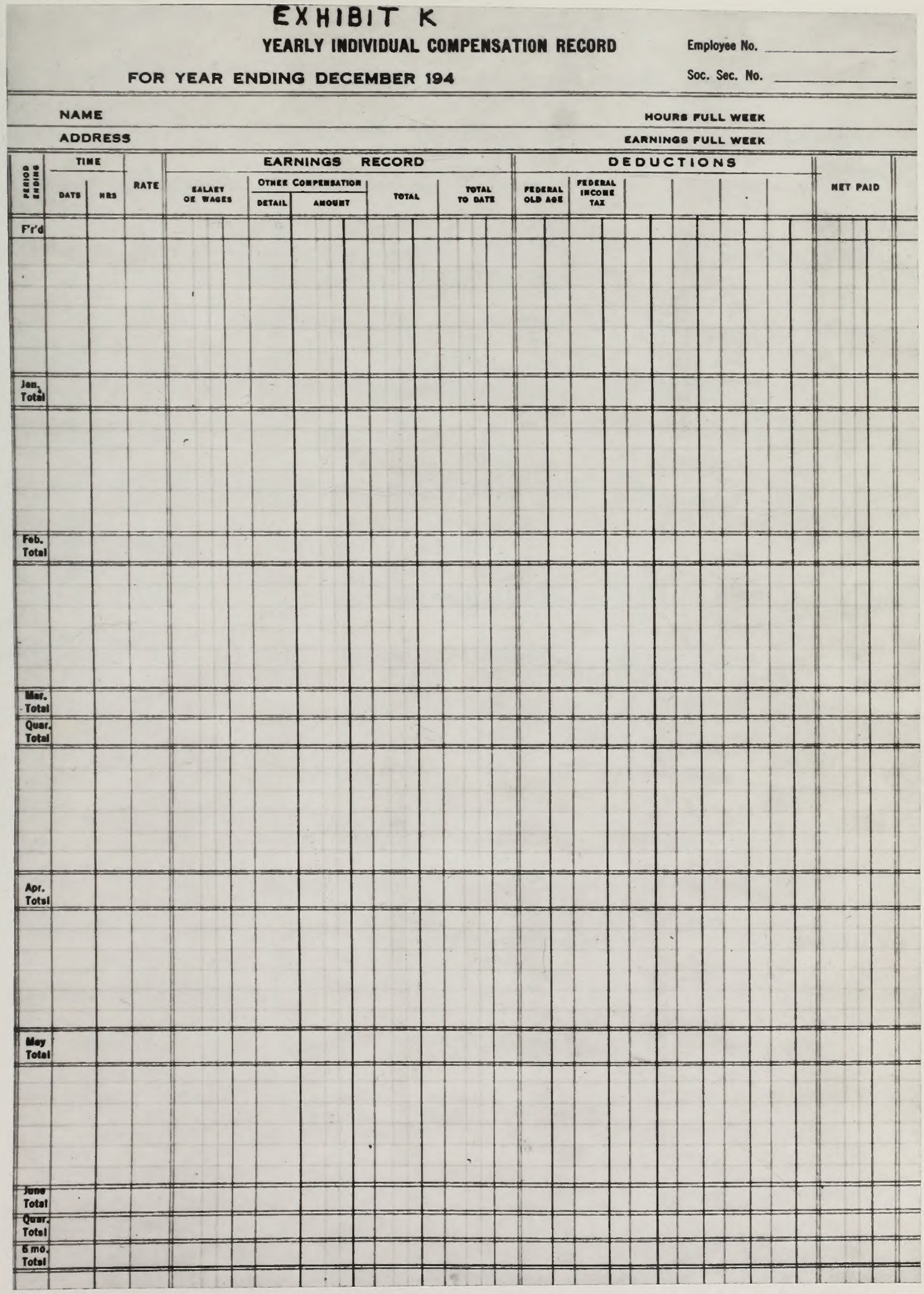

EXHIBIT K

YEARLY INDIVIDUAL COMPENSATION RECORD

Employee No. ____________

FOR YEAR ENDING DECEMBER 194

Soc. Sec. No. ____________

NAME

HOURS FULL WEEK

ADDRESS

EARNINGS FULL WEEK

PERIOD ENDING	TIME		RATE	EARNINGS RECORD					DEDUCTIONS						NET PAID
	DAYS	HRS		SALARY OR WAGES	OTHER COMPENSATION		TOTAL	TOTAL TO DATE	FEDERAL OLD AGE	FEDERAL INCOME TAX					
					DETAIL	AMOUNT									
F'r'd															
Jan. Total															
Feb. Total															
Mar. Total															
Quar. Total															
Apr. Total															
May Total															
June Total															
Quar. Total															
6 mo. Total															

The cheques should contain two signatures of officials of the organization. Before paying employees some identification should be required in order to safeguard against payroll padding and increase labor costs.

g. Record of hours worked by production and service departments

A monthly summary of hours worked within each producing and service departments should be sent to the cost department for analysis. This summary record may be used as the producing departments and for apportioning overhead expenses among products.

Woolley(1) reported that certain auxiliary units render service to all other production departments. He suggested that boiler-room salaries should be classified as direct labor rather than indirect. By charging total departmental cost on the basis of the individual machines' consumption of steam the labor component of steam cost does not again appear in the further compiling of cost data.

Thompson (2) believed that each three month period should be divided into two periods of four weeks and one of five weeks, in order to avoid the inconvenience of

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(1) Woolley, E.S., "Accounting for Labor", The Accountants Digest, Vol. 10, No. 1, September, 1944

(2) Thompson, C.B.M. "How to Find Factory Costs", A.W. Shaw Co., Chicago, 1916, pp. 103-109

splitting a weekly payroll at the end of calendar months.

Greer and Willcox(1) suggested that the organization may utilize labor for a week or more before payments are made to the employees. In this case the amount of labor utilized should be credited to a Labor Accrual Account as the utilization takes place. Payments would be charged against this account when made. The balance would represent liability for expenses accrued.

3. Cost Department Functions

After the time cards have been used by the payroll department they should be sent to the cost department. Here they are used for the labor distribution and are sorted into departments. The cards which have been sorted show the daily direct cost by operations within the producing departments as well as labor costs for each service department.

Monthly labor distribution also provides the basis from which the estimated compensation insurance expense is computed. The rates are based in terms of each $100.00 of payroll by occupations. The rates used to compute this overhead expense item are usually those charged by the insurer for the preceding year.

When the time cards have been sorted, the total for each labor operation is entered. It should be noted that the gross earnings shown on the payroll book are the

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(1) Greer, H.C., and Willcox, R.S., "Problems in Cost Accounting", McGraw-Hill Book Company, Inc., New York, 1931, pp. 7-11

same as the total labor distribution. The labor distribution provides the data from which the cost journal entries are prepared at the end of each month.

VIII. OVERHEAD EXPENSES

A. Meaning of Overhead Expenses

Factory overhead is the aggregate of all the various manufacturing expense accounts, exclusive of direct material and labor. This includes all the manufacturing expenses which cannot be considered as a direct charge against the products. Manufacturing overhead expenses comprise many different indirect supplies, numerous types of indirect labor and a large variety of miscellaneous services and charges.

A list of the more common overhead expense items is given for the purpose of presenting the complexity of this type of charge as an element of cost. These expenses include spoilage, heat and power, compensation and fire insurance, water, repairs and maintenance, property taxes, depreciation of plant and equipment, shrinkage, indirect labor and supplies, etc.

Jenner(1) mentioned that the real problem concerning overhead is the distribution. He believed that it was much better to have a system which would enable you to distribute overhead in any way, then to have a good idea as to how you would like to distribute them and no means of doing it.

(1) Jenner, G.T., "Overheads and Their Treatment", The Accountants Digest, Vol. 9, No. 2, December, 1943

B. Classification of Overhead Expenses

Every item of this type of expense is subject to a dual classification. All overhead expenses should be classified in accordance with their nature, being variable, non-variable, or semi-variable. In addition, they should be classified as either direct or indirect by their allocation to either the producing or service departments.

This dual classification must be made in order to develop normal overhead or burden rates, to compute overhead costing rates, and to control overhead expenditures of a variable nature. The use of an overhead expense classification also tends to produce greater orderliness in designing the factory overhead expense accounts.

Blocker(1) defined variable costs as items, such as supplies, power, and indirect labor which would tend to fluctuate as business either increased or decreased. Non-variable or fixed costs included depreciation, taxes, rent, insurance, etc., which remained constant regardless of business activity.

Semi-variable expenses, on the other hand, are expenses which have certain quantities of both variable and non-variable. Factory positions of indirect labor which pay monthly salaries to foremen and clerks are an example of this class.

(1) Blocker, J.G., op. cit., pp.123-133

Direct overhead expenses are those which can be prorated directly to some overhead expense account without having been assembled previously in some other service department account. By using this method the greatest possible accuracy in the overhead charges applicable to the department will be attained.

An indirect overhead expense item is one that is distributed by some pro-rate basis from the service department expense account. At the end of each month the total expenses of the service departments are distributed to the production departments.

However, Lowe (1) believed an engineer's salary should be allocated and sub-divided between the repairs, general maintenance and servicing and manufacturing accounts. This would be accomplished by requiring the engineer to make out a daily time sheet in detail.

Irwin (2) pointed out that by distribution of certain costs to production departments the allocation of fixed and variable expenses could influence the ultimate cost of production.

(1) Lowe, Gordon, "The Supervision of Maintenance Costs", The Accountants Digest, Vol. 8, No. 1, September, 1942

(2) Irwin, Leslie, W., "Fixed and Variable Costs", the Accountants Digest, Vol. 7, No. 3, March, 1942

C. Assembly of Overhead Expenses

Either a single overhead expense control account can be used or one for each individual department. The number of overhead expense columns required in the various journals in which overhead items appear will depend upon the number of overhead expense control accounts desired.

As previously mentioned (1) the overhead expenses are entered in the Voucher Register and posted to both the control account in the factory ledger and in the overhead expense ledger. The overhead expenses entered in the subsidiary ledger are summarized and the total of the individual account balances must agree with the balance shown by the control account. These expenses can now be shown on a sheet called the overhead expense distribution sheet where they are allocated to the specific departments or prorated among the various departments to which they are applicable.

In summing up the overhead expense accounts, all variable, non-variable, and semi-variable accounts should be grouped together.

D. Preparation of Overhead Expense Disbribution Sheet

The names of the overhead expense accounts are arranged on the distribution sheet in the same order as they appear in the subsidiary ledger. This uniformity in the setup facilitates the transfer of amounts to the sheet at the

(1) See Section V, Voucher Register pp. 51

end of each month.

The preparation of this sheet serves many purposes, namely, provides a methodical procedure in allocating and prorating overhead expenses to producing and service departments, gives amount of direct overhead expenses allocated to each department, shows distribution of the service depart- expenses to the producing departments, and forms a basis for the preparation of budgets for controlling expenses.

E. Allocating of Overhead Expense

The principle of overhead expense allocation is based upon the identification of the overhead expense item. It is the placing or charging of an amount of overhead direct to the department or departments to which it belongs, there being no division of it to various departments on an average basis.

Some of the overhead expense items allocated to producing and service departments are fuel, spoilage, compensation insurance, indirect labor, depreciation, etc. The chief bases on which these allocations may be made to the department are by use of meter measurement, floor area, number of employees or cost value of equipment.

F. Proration of Overhead Expense

Proration means the allocating of overhead expense among two or more producing or service departments according to a certain rate. The most common bases used are: cubic foot space, radiation surface, floor area, and number of

employees.

In certain instances arbitrary figures may be obtained, for example, in distribution of electricity costs the estimation of wattage on the basis of the number of light bulbs used in a department. Also where meters are not available, the estimated number of hours the lamps are used daily could be used.

G. Overhead Expense Distribution

Overhead expense distribution is the transfer of the service department expenses to the producing departments at the end of the monthly period. In certain cases this may even take place between certain service departments. The most convenient way of accomplishing this task is by use of a distribution work sheet previously mentioned.(1)

The purpose of this operation is to charge the producing departments with their share of the services received from the service departments. When this sheet is used the various costs may be more easily ascertained and control measures more readily installed. After the total monthly expenses of each service department have been obtained, they must be transferred to the producing departments so that they may be reflected as part of the total overhead expense to be charged to the products produced.

The plant's cost system design will determine whether or not any journal entries will be necessary in

(1) See Section VIII, Preparation of Overhead Expense Distribution Sheet, pp. 87

connection with the overhead expense distribution. Where a single overhead control expense account is used, there is no necessity for any journal entries because all the overhead expense transactions have been debited to the control account during the month.

H. Distribution of Service Department Expenses

The method of distributing service department expenses to producing departments will vary a great deal in the different plants. Richmond (1) advocated that all expenses be distributed on a time basis as rent, insurance, electricity, repairs and maintenance, etc., are always purchased on a time basis.

Perhaps a better method would be to distribute power department costs, on a measured meter rate, cubic foot space, radiation surface, or hourly rate determined by engineers. The maintainance department could distribute expense direct to the machine and for building repairs charge the expense to the departments effected by floor space occupied. The personnel department expense distribution could be worked out by allocating its expenses to the production departments on the number of employees working in each department. Purchasing, supervision, timekeeping, and payroll department expenses could be allocated on the basis of total man hours while the storeroom department could use direct labor hours or cost of materials.

(1) Richmond, A.D., "What is the Best Method of Applying Expense", The Accountants Digest, Vol.9, No. 3, March,1944

I. Machine Hour Rate Method of Apportioning Overhead Costs

In dairy milk plants the investment in machinery is quite high due to soaker type washers which cost in the neighborhood of $20,000.00. With heavy depreciation and maintenance charges as well as large power and insurance expense the machine hour rate method of apportioning overhead cost is one of the better methods to allocate overhead expenses.

Thompson (1) explained that the essence of the machine hour rate plan was the collection of all factory indirect expense into an hourly charge against the product going through each machine.

From the cost accounting standpoint, the machine hour rate is an accurate method of apportioning overhead costs and from the management standpoint, it involves a method which is scientific, logical, and sound. It also provides a basis for the measurement of the monthly cost of idle machines.

The computation of the rate is rather complicated as estimated direct overhead expense allocated to the specific machines for a one-yearperiod, as well as building overhead expense and miscellaneous general overhead and service department expenses are required. From these three preceding groups the estimated machine hour overhead cost rates may be obtained.

After the cost rates have been computed they are

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(1) Thompson, C.B., op. cit., pp. 84-95

then used to distribute the overhead expenses to the products bottled on the basis of the amount of time each machine is used in the production of a run of products. This time can be obtained by time cards, recording devices, production records, etc. With the use of these predetermined rates the cost of production can be obtained immediately.

Sometimes a supplementary burden rate is established to account for the variance between the actual and the estimated machine hour rate. This rate may be used when it is apparent that the actual overhead expense will be less or greater that the budgeted overhead rate. Neuner (1) suggested that the machine hour rate be calculated on only those expenses which originate in the respective departments and for all other factory expenses a supplementary rate should be set up.

J. Under-absorbed and Over-absorbed Overhead Account

A comparison of the actual departmental expense with the applied departmental expense will give the under-absorbed or over-absorbed overhead. If the over-or-under-applied burden at the end of the month be small it should be carried forward from month to month until the end of the year where the amount is closed into the cost of goods sold account.

(1) Neuner, J.J.W., "Cost Accounting Principles and Practice", Richard D. Irwin, Inc., Chicago, 1942 pp.245-6

The over-or-underapplied overhead may also be prorated over the work-in-process, finished goods, and cost of goods sold accounts through a supplementary rate. If this method is used it may prove too costly if any adjustments are necessary.

The over-absorbed overhead expense may be caused by internal conditions because of machinery breakdown, material shortage, inexperienced workmanship, poor scheduling and routing, etc. In the milk business seasonal consumption would also be a major cause as sales always rise in the warm weather.

IX. STANDARD COST SYSTEM

While no system of accounting can be considered complete and suited to meet modern requirements which does not furnish the essential information which the system is designed to produce, the fact cannot be too strongly emphasized that the routine necessary to obtain these results will vary greatly in different milk plants. It should be the objective of the designer of any cost system to plan his design in such a manner as will enable him to secure the desired results in the simplest and most inexpensive way possible.

Standard cost accounting concerns operations of all descriptions from procurement of raw materials to the finished product and is closely linked with budgetary control. A standard is a predetermined measurement which should be achieved under normal working conditions. In the development of a standard cost system, the standards should be set with painstaking care after careful study has been made of present and past production activities.

A. Prerequisites to Installation of Standard Costs

The system should be suitable for the particular plant in which it is to be used. It should cover completely all the detail phases of cost, including standard allowances for labor, material, and overhead. Perry (1) suggested the layout of the system should be completely co-ordinated in

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(1) Perry, William E., "Case Study of a Standard Cost System", N.A.C.A. Bulletin, Vol. 22, No. 1, September 1, 1940

all details with the manufacturing operations. The system and reports should be clearly understandable to both the cost accountants who operate it, and to the operation executives who would use the reports.

Elsman (1) believed the system should be simple and streamlined so that cost figures would be as current as the daily news, provide sufficient internal control to prevent theft, collusion, and serious errors.

Longman (2) remarked that the expenses entered in each account should be as homogenous as possible and the titles of the accounts should be prepared in such a fashion that there can be no possible question as to which accounts should include individual expenses.

Coutts (3) on the other hand, mentioned four stages which a cost system would pass through, crudity with uncertainly and undependability, adding gadgets and extending details, reducing the complexity and number of parts, and finally giving economy and dependability.

Gairns (4) observed it often took from three to five

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(1) Elsman, T.R., "Standard for Cost Control and Cost Determination", N.A.C.A. Bulletin, Vol. 26, No. 8, December 15, 1944

(2) Longman, D.R., "Distribution Cost Analysis", Harper & Brothers Publishers, New York, 1941, pp.14-26

(3) Coutts, Max C., "Review Your Costing", The Accountants Digest, Vol.8, no. 4, June 1943

(4) Gairns, A.J., "The Cost Investigator", The Accountants Digest, Vol 7, No. 4, June 1942

years to properly institute a cost system covering all requirements of a business. In most cases the information supplied for the compilation of standard costs in the development stage must come from old, untried, and unsatisfactory records which is the only means available on which to commence the system.

B. Classification of Standard Cost Accounting Procedures

Neuner (1) stated there were three general plans for using standard costs in an accounting system:

1. Standards may be used as statistical data, without appearing in the books of account.
2. Standards may be recorded in the accounts as memorandum information for comparative purposes.
3. Standards may be entered as operating data in the accounts.

The selection of any of the above plans will depend upon management's need for information and the money which can be expended for securing costs. In outlining the cost accounts in Section IV (2) no mention was made of the use of standards in these accounts.

It has been found that the third method mentioned above is the best of the three outlined. When materials are purchased, they should be entered in the material account at

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(1) Neuner, J.J.W., op. cit., pp.510

(2) See Section IV, Production Divisions Cost Accounts, pp. 44-47

the standard price and credited to accouts payable at actual prices; the difference being charged to a material price variation account.

Labor costs, on the other hand, can be recorded by charging direct labor account with the actual hours at standard costs and crediting accrued payroll with actual hours at standard cost. The difference is charged or credited to a labor price variation account.

Manufacturing expenses should be handled in the same manner as labor costs, the difference between standard costs and actual costs should be charged or credited to factory expense efficiency variation.

If standards have been carefully set up and frequently revised the variation accounts will reflect losses and gains due to efficiency factors. These variations accounts at the end of the accounting period should be closed into cost of sales account.

Gillespie (1) outlined a method of charging work-in-process with standard cost of operations completed and crediting with standard cost of finished goods completed, charging work-in-process with actual cost and crediting with standard cost of production, or charging work-in-process with actual and standard cost of operations completed and crediting with actual and standard cost of finished goods completed.

(1) Gillespie, C., "Accounting Procedure for Standard Costs", The Ronald Press Company, New York, 1942, pp.23-54

C. Setting up Operation Standards

The setting of standards is one of the most important features of a standard cost system. These standards should be set with the greatest of care, careful thought, and good judgment. Standards are important as they may be used month after month as measuring sticks of plant performance and as indicators of the cost variances.

Alford (1) stated that the following factors should be observed in setting budget standards; comparisons must be made at frequent regular intervals between budgeted and actual results and the necessary action taken, proper procedure covering preparation and use of budgets must be established, and they must be sufficiently flexible to provide for unforeseen conditions but rigid enough to give control of activities.

Pendlebury (2) believed that the point of making the foremen take the initiative in requesting changes in the budget set up is a very important since they can never use the alibi that the budget was unfair. If after a trial budgets set up by the accounting department did not appear to be correct they should be revised immediately.

(1) Alford, L.P., "Cost and Production Handbook", The Ronald Press Company, New York, 1937, pp.630-670

(2) Pendlebury, Charles, "Expense Budgeting", N.A.C.A. Bulletin Vol. 24, No. 5, November 1, 1942

Kassander (1) mentioned that comparisons of actual results with the budget should disclose whether or not the operations of the plant have adhered to the previously adopted plan. The budget reports should disclose to management the character of the control whether good or bad so that conditions could be improved in the future.

Freeman (2) was of the opinion that long-range plans should provide only the broad outlines while the shorter-range budgets should fill in the details. He recommended that inventories should be so budgeted that stocks should be built up in anticipation of an expected boom and by coming out of the boom with depleted inventories.

Middleton (3) suggested that budgetary control introduced a completely new era in producing standard costs. The forward planning in detail of requirements of material, labor, and overhead intorduced a new phase when "variations from standards" were introduced.

1. Direct Material Standards

In a standard cost system two different types of direct materials standards should be set. First, the stand-

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(1) Kassander, A.R., "Standard Costs and Budgets-How do They Control?", The Accountants Digest, Vol. 8, No. 1, September, 1942

(2) Freeman, E.S., "Budgetary and Financial Policies for Industrial Corporations", N.A.C.A. Bulletin Vol. 25, No. 24, August 15, 1944

(3) Middleton, J.R., "Some Aspects of Costing", The Accountants Digest, Vol. 7, No. 3, March, 1942

ard quantity of direct materials required to complete each unit of finished product and second, a standard price must be set for each item of direct material. In order to set up this standard a certain percentage should be added to the raw material to take care of shrinkage and other normal operation losses. By careful study of past records and present controlled raw milk prices, the standard price per unit of material may be set.

2. Direct Labor Standards

Standard time and standard labor rate per hour should be set up for each operation in the plant. Schlatter (1) concluded that standards could be set by careful time and motion studies. Since the work in the production departments in the milk plants is usually proformed by a "gang" of men, the standard must be the "gang time". If the time wages are paid by rates set by contract with a labor union then they must be considered as the standard.

3. Factory Overhead Standards

For standard overhead costing purposes, all of the service departments expenses and the general overhead expenses should be combined into one general overhead expense budget. The first step in building a flexible overhead expense budget is the study of the cost data reflected in the

(1) Schlatter, C.F., "advanced Cost Accounting", John Wiley & Sons, Inc., New York, 1939, pp 109-111

overhead expense distribution sheets of the past. Classification of the overhead items as controllable or non-controllable from the foreman's point of view should be made.

An annual budget of overhead expenses for each production and service department is prepared for the normal or standard point of productive output. This is the point at which the total amount of all of the variable, semi-variable or non-variable overhead expenses are to be absorbeed into the cost of production. Even though the productive output of each month in the plant is not uniform the monthly budget figures at 100% or standard are ordinarily set so that they equal one-twelfth of the annual total.

The amount of each overhead expense item for each cost center should be set up on a sliding scale from the shut down point or zero to the maximum capacity of each cost center. The flexible budget may be scaled at intervals of five or ten percent. Williamson (1) believed the practical capacity is generally considered to be in the vicinity of 85% of the theoretical capacity. This latter is the theoretical output of the plant working over a given period under perfect conditions, no allowances being made for breakdowns, repairs, idleness, etc. Bryant (2) made the statement that production seldom exceeds 80% of capacity.

(1) Williamson, H.B., "Cost Standards", The Accountants Digest, Vol. 7, No. 4, June, 1942

(2) Bryant, J., "Accounting for Factory Overhead", The Accountants Digest, Vol. 10, No. 1, September, 1944

One function of flexible budgets as stated by Saliers (1) is to provide danger signals so that increased average costs resulting from over-production with present facilities may be avoided.

Heiser (2) found that an effective operating budget was an effective tool for constructing and maintaining a cost system. Standards should be established so as to create variances which can be used for management to determine the causes for operating inefficiencies and such variances should be isolated so that they are not made useless by the inclusion of several contributing factors.

Myers (3) felt when actual results varied considerably from budgeted figures there was no proof that standards did not exist or were not made use of in the preparation of the budget.

D. Revising the Standards

Standards should be revised when a pronounced rise or drop in general business activity of the plant has taken place. When the Milk Board raises or lowers the cost of the raw milk prices new standards must be set. Rates should also

(1) Saliers, E.A., "Differential Costs", The Accountants Digest, Vol. 9, No. 2, December, 1943

(2) Heiser, Herman C., "The Application of Standard Costs to an Operating Budget", N.A.C.A. Bulletin Vol. 24, No. 3, October 1, 1942

(3) Myers, Herbert J., "Do Standard Costs Aid War Production?", N.A.C.A., Bulletin Vol. 25, No. 1, September, 1943

be revised when new labor contracts changes the existing rates. The manufacturing overhead rates must be changed when the plant has installed an extraordinary amount of new equipment or improvements.

E. Setting Forth Variances

The measurement of efficiency is basically a comparison of actual performance with what the performance should have been. If unit costs are used the comparison is between actual unit cost and a standard unit cost.

Dohr, Inghram, and Love (1) stated the difference between actual and standard is analyzed as to differences or variances. Material price variance being the difference between the price actually paid for materials and the standard price. On the other hand, material quantity variance is the difference between the quantity of material used and the standard quantity.

Labor price variance is the difference between the wage actually paid and the standard wage rate while the labor efficiency variance is the difference between the labor time actually required and the standard labor time.

The factory service price variance is the difference between the price actually paid for the various elements of service and the budgeted figures. The time actually required in the factory and the standard time of performance is known as the factory efficiency variance.

(1) Dohr, J.L., Inghram, H.A., and Love, A.I., op.cit., pp.27-35

Harrison (1) listed various causes of variations from standard. He believed they were caused by calendar variations, idle time, production efficiency, material consumption and prices, labor time and rates, variations in distribution expenses, etc.

1. Material Price Variance

In the milk plant this type of variance would not be found since the price is set by the Milk Control Board. This price and the standard price should always be the same.

2. Material Quantity Variance

The material quantity variance is the indicator of the efficiency with which materials were utilized in the production processes during the accounting period. From daily or weekly production records the quantities of materials consumed may be found. A debit balance in this account would show the total cost of materials used was over predetermined standards while a credit would indicate a saving.

3. Labor Price Variance

The standard rate would be the same as stated in the union contract if employees belong to a union. In non-union plants the wage variance would reflect the difference in the existing wage scale and the standards. If wages were in excess the account would receive a debit while if they were under the standards a credit balance would be noted at the end of the period.

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(1) Harrison, G.C., "Standard Costs Installation, Operation, and Use," The Ronald Press Company, New York, 1930, pp.49-72

4. Labor Efficiency Variances

The labor efficiency variance measures the direct labor that has been applied to the production for the period. A debit balance would indicate that the plant had experienced a loss because direct labor hours were in excess of standard while a credit would show a saving has resulted because fewer direct labor hours were required than standard performance allowed.

5. Factory Service Variance

This variance would indicate how closely management had adhered to the standard budget set up for overhead expenses. A debit balance would show that actual overhead expenses had exceeded the standard budget while a credit balance would show the opposite. The variance for each expense should be analyzed carefully and causes for its existence should be determined.

6. Factory Efficiency Variance

This variance would inform management of the overhead cost of excess direct labor hours applied to the period's production or the saving in overhead expense resulting in completion of the work in less time than the required standard hours.

7. Idle Capacity Variance

Idle capacity variance is computed by comparing the standard direct labor hours per the production budget

with the actual direct labor hours as shown by the payroll for the period and by multiplying the number of excess or deficiency hours by the standard overhead expense rate.

As previously mentioned (1) the balances in these variances accounts at the end of the accounting period should be closed into the cost of goods sold account.

After the extent of difference from the standards have been found by comparison, it is necessary to make reports and place the responsibility for those differences. A difference between the actual cost and the standard may be due to several reasons previously stated and it is necessary to ascertain the true reason for the difference before responsibility for it can be determined.

(1) See Section VIII, Under-absorbed and Over-absorbed Overhead Account, pp.93

X. PRINCIPLES OF PRESENTATION OF COST REPORTS

In considering the set-up of reports which are to be instruments of cost control, it must be recognized that an infinite number of combinations of conditions may exist. Only the important principles can be pointed out in this thesis and the importance of making these reports as simple, direct, and effective as possible cannot be overlooked.

A. Nature of Cost Reports

Cost accounting reports may be classified as either financial which include cost statements of material, labor, and expenses, summary cost of production and budget statements or efficiency which include idle machines, machine repairs, spoiled goods, plant productivity, etc. These reports may be classified on a time basis, that is, daily, weekly, or monthly. The greater the control desired, the shorter the time interval of the report should be.

Fiske (1) was of the opinion that the industrial cost analyst was always concerned with the accumulation and detailed analysis of factory expenses to provide the facts needed by operating executives.

(1) Fiske, Wyman P., "The Nature of Costs and Its Uses", N.A.C.A., Bulletin Vol. 23, No. 13, March 15, 1942

Racine (1) on the other hand, believed a cost finding system was one of the most valuable kinds of insurance, when properly designed and operated, that a business concern could have. The basis of this insurance is cost reports which tend to prevent costly mistakes and provide benefits that far surpass the incidental cost of operation.

Smallpiece (2) stated in costing no data was worth collecting and no figures worth compiling unless they would assist management to manage the business better than could without them.

B. Requirements of Cost Reports

The style of reports should be characterized by brevity, simplicity, and comparability. If the report is to be read brevity is always an advantage while simplicity is necessary if the report is to be understood.

The scope of the report should be determined by the people who will receive it. For major production executives the reports would cover matters of the entire organization while foremen reports would cover the activities under their jurisdiction.

(1) Racine, G.F., "Simplication of Cost Records", The Accountants Digest, Vol. 8, No. 3, March, 1943

(2) Smallpiece, Basil, "The Inclusion of Fixed Overheads in Costs", The Accountants Digest, Vol. 7, No. 3, March, 1942

Smith (1) advised from a production standpoint, data should be stated in terms of physical units, like pounds, men, etc., while financial reports should be converted into dollars.

Howell (2) emphasized there must be a willingness to drop the bookkeeping point of view and not to present reports merely because they tie in with the general books. It must be remembered that a report which is not accurate shouldn't be issued as it merely raises a cloud of speculation.

Lang (3) demonstrated that the title should be descriptive of the nature of the report and the period covered clearly indicated. The form should be simple and adjusted to understanding of persons for whom they are intended. Columnar headings and legends should be clear and concise.

In cost reports emphasis should be placed upon cost items which are most important. Comparisons should be used wherever possible. The reports should indicate methods to effect improvement in operation and reduction of costs.

(1) Smith, Newman L., "Cost Determination in Aircraft Production", N.A.C.A., Bulletin Vol. 25, No. 12 February 15, 1944
(2) Howell, Harry, "Cost Reports For Management", N.A.C.A. Bulletin Vol. 22, No. 11, February 1, 1941
(3) Lang, T., op. cit., pp.3-13

They should be presented in such a way that responsibility for results indicated can be placed immediately and without question.

C. How Cost Control in Maintained

Accounts of the system should be fitted so that costs can be segrated by individual repsonsibilities. Variations of actual costs from standard or budget should be segregated and shown in a report of sufficient detail so that responsibility for each variance can be definitely determined.

Frequent reports on the costs for which people are responsible, should be supplied each person who is responsible for control of any cost element. These reports should also emphasize variances of actual costs from standards or budgeted figures. Apportioned costs over which the person has no control should not be combined in his cost reports.

D. What the Production Manager Requires?

It is the production manager's business to see that jobs are done at a cost not exceeding former or standard costs. It is his duty tosee that production is turned out and not being delayed in its passage through the plant.

There are hundreds of forms, each of which has been effective in its particular use, but none of which could be recommended for all purposes. While general types of forms can be standardized, the individual forms themselves seldom can be. Forms needed for production control must, therefore, be separately and specially designed and laid out for each

EXHIBIT L

REPORT OF IDLE MACHINE TIME

MACHINE	OPERATING HOURS	IDLE HOURS	IDLE TIME BURDEN RATE	COST OF IDLE TIME	REASONS

EXHIBIT M

COST AND VARIANCE FACTORY STATEMENT

VARIANCES		ACCOUNT	ACTUAL YEAR TO DATE	THIS PERIOD		
THIS PERIOD	YEAR TO DATE			EXT. BUDG. ALLOWANCE	CURRENT ALLOWANCE	ACTUAL

different cost installation.

The two forms listed, Report of Idle Machine Time and Cost and Variance Factory Statement, could be used in almost any standard cost system. The first mentioned is to obtain the number of hours and cost of machine idle time for each week while the latter is to indicate variations from standard costs.

A register of extra costs, classified by causes should be kept up. This would form the basis of improvement for such causes as are remediable by the production office.

Baldwin (1) found when weighed receptacles were placed at various points of a milk plant where bottles were handled the number of bottles broken per day could be estimated. At the end of the day's work the broken glass was weighed and converted into the number of quart bottles lost by using the average weight of an empty quart bottle. While it must be recognized that the figures obtained would not be strictly, accurate because of sizes other than quarts, being broken, they should be close enough to give good practical results.

(1) Baldwin, Bruce, "Cost Reports for Plant Managers", I.N.A.D., The Association Bulletin, Vol. 33, No. 16, March 24, 1941

SUMMARY

Various types of cost systems have been outlined. Definitions of standard costs from different sources as well as advantages of using this type of system in the Market Milk Industry were noted.

Numerous examples of the cost of raw milk and the cost of hauling raw milk to the plant were cited. Plant costs were divided into equipment, plant labor, and cost of supplies. Tables were listed giving in detail what made up the cost of a quart of milk in Massachusetts and New Jersey. Cost of manufacturing fluid milk in other sections of the country were pointed out. A method of forecasting monthly receipts of milk was mentioned. Different types of cost systems in use by different plants were briefly outlined.

A short detailed description of operations within the plant as divided into receiving and sampling, storing raw milk, filtering and pasteurizing, bottling, and storing finished product was given. The various service departments and their function in the milk plant were outlined.

Systems for coding accounts in the factory ledger were cited. Cost accounts which could be used in a standard cost system were mentioned. Various types of entries which would be made to these accounts were discussed. The control account between the factory set of books and the general office set of books was outlined.

Various types of accounting journals and ledgers were outlined and illustrated.

A definition of what material costs are is given. The objectives of raw material accounting as well as proper control upon production costs were cited. The function of the purchasing and stores department in relation to materials was discussed. Adjustments for obsolete materials were suggested.

Labor costs and the record keeping of this cost was outlined in detail. Forms were suggested for the payroll book and individual earning record. Method for preparation of factory payroll record, individual earning record, and payroll was suggested.

All overhead expenses were classified in accordance with their nature, being variable, non-variable or semi-variable. In addition they were classified as either direct or indirect. The distribution of overhead expenses and the allocation of overhead expenses and distribution of service department expenses were given. The method known as machine hour rate of apportioning overhead costs was outlined.

Prerequisites to installation of standard costs were listed. Suggestions for setting up direct material, direct labor, and factory overhead standards were outlined. Variances from standard were divided into seven classification and each class discussed.

Principles of presentation of cost reports as well as illustrated forms were given.

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